File Servers
for
AppleTalk
Networks

File Servers for AppleTalk Networks

Apple Computer B.V.
Afdeling Strategic Marketing

Introductie

Dit rapport File Servers for AppleTalk Networks is
ontwikkeld door de Systems Marketing Group van Apple
Computer, Inc. te Cupertino ten behoeve van het sales- en
reseller-kanaal. Op enkele kleine wijzigingen na bieden wij
u deze uitgave integraal aan. Wij hopen u hiermee
gedetailleerde achtergrondinformatie te verschaffen omtrent
de belangrijkste file server-systemen uit Macintosh- en MS-
DOS-omgevingen.

De in deze uitgave frequent voorkomende systemen van
Novell en 3Com worden vooral aangetroffen in de
multivendor-omgeving Apple-IBM-Digital.
Ook voor de integratie van Macintosh in MS-DOS-
omgevingen zult u in deze uitgave de nodige
aanknopingspunten vinden. Vooral op dit gebied worden
een aantal vergelijkingen tussen file server-capaciteiten
getrokken.

De voor u liggende uitgave weerspiegelt de verdergaande
succesvolle ontwikkeling van Apple's Networking &
Communications benadering. U dient er echter wel rekening
mee te houden dat in deze uitgave vermelde prijzen slechts
(tijdelijk) van toepassing zijn op de Amerikaanse markt.
Apple Computer B.V. aanvaardt dan ook geen enkele
verantwoordelijkheid voor in deze uitgave vermelde prijzen.
Tevens dient te worden opgemerkt dat vermelding van
produkten niet automatisch betekent dat deze ook in
Nederland leverbaar zijn.

Apple Computer B.V.

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About this report

This is a summary of the "File Servers for AppleTalk® Networks" report. The full report provides in-depth information on the most popular file servers that support both Apple® Macintosh® and MS-DOS workstations. This summary is an abbreviated version of the full report; it contains some of the most important information in a condensed form.

While reading the summary, if you want more detailed information, you should consult the corresponding section of the full report.

What is a file server?

A file server is a device that allows personal computers to share files and applications on a network. Personal computers using a file server are called clients of the file server. File servers provide their clients with a safe, common storage area, where a number of people can access the same information simultaneously.

A file server increases the productivity of a group when several members of the group need access to the same information, especially when that information is frequently updated. A file server also facilitates the work of a group of "specialists" who work on different parts of the same project.

Dedicated vs. nondedicated servers

There are two basic types of file server implementations: dedicated and nondedicated.

Dedicated file servers are personal computers or other specialized hardware devices that run file server software or a network-server operating system. They are called dedicated because the server's power and resources are dedicated to networked users (clients). The system acting as a server may not be used simultaneously as a workstation, though it may provide several network services.

Nondedicated, or background, servers are software products that operate in the background of a workstation, allowing other workstations to share its disk. Some vendors incorrectly refer to a system of multiple nondedicated file servers as providing "distributed file service."

Dedicated servers offer many advantages, including better performance, a higher degree of security, better reliability, and simplified administration. Dedicated servers also provide a consistent, common place for data to reside, and a centralized spot for backup.

Background servers are convenient for casual file exchange and transfer. They cost less than dedicated servers for very small networks (2–4 people with no plans for growth), and they allow users to directly access each other's disks without going through a "middleman."

AppleTalk Filing Protocol (AFP) compatibility

The AppleTalk Filing Protocol (AFP) is the industry standard for AppleTalk Network System file service. It allows the transparent sharing of files between different computers and operating systems. AFP supports file service for Macintosh, MS-DOS, Apple IIe, and Apple IIGS computers.

The AFP standard has two parts: the server and the client. All AFP servers accept and process the same network calls, as defined in the AFP protocol specifications. Currently, there are two AFP versions, 1.1 and 2.0. Version 2.0 includes extensions for the support of Apple IIe and Apple IIGS® computers.

What does AFP compatibility entail?

There are AFP-compatible servers and AFP-compatible client software.

AFP-compatible servers support all the required features of the AFP standard version 1.1 or 2.0, including user authentication methods, access controls, and long and short name maintenance. AFP-compatible servers should appear in the Chooser desk accessory of all AFP-compatible clients.

AFP client software has to be compatible on three levels:

- User interface. The client implementation must support the AFP user interface, which includes recognition in the Chooser as an AFP server, the log-on process, compatibility with the Access Privileges desk accessory, and the appearance of mounted volumes on the desktop.
- Operating system. AFP client implementations take native file system requests and translate them to AFP-compatible file service requests.
- File service protocol interface. Applications programs may make two types of calls relating to file service: native file system calls or calls specific to network file service. File server client software that is compatible with native file system calls will work with most current applications. However, network-specific software and next-generation "network-aware" applications will increasingly take advantage of the extended features of these network interfaces. Client implementations that don't support these network-specific calls won't support the next-generation software either.

What does AFP compatibility mean for users?

AFP compatibility gives users three main benefits: a standard user interface, product compatibility, and AppleTalk Network System compatibility.

AFP provides a standard user interface for sharing information on a network; it extends many of the Macintosh benefits into a "workgroup" setting. Once users know how to work with one AFP-compatible server, they know how to work with all of them.

AFP is the standard AppleTalk Network System development environment. Because it is widely supported by network vendors, it provides a stable environment in which software developers can create next-generation network applications that will work on a variety of server hardware platforms. Users who have AFP-compatible servers and client software will be able to use these next-generation software products.

Finally, AFP is part of the AppleTalk Network System, so users who choose AFP servers gain all the advantages of Apple's standard networking environment. These advantages include support for multiple types of network cabling, simplified network administration, and advanced networking features such as zones, routers, and gateways to other networking environments.

Industry support for AFP

AFP-compatible server implementations are now available for most major computing platforms. AFP client software for the most popular personal computers is available from Apple. And full support for AppleTalk and AFP file service is available, or will soon be available, from the major MS-DOS network vendors: Novell and 3Com. Through a strategic alliance, Apple and Digital are closely integrating AFP and other AppleTalk network services with the popular VAX™ family of computers. Industry support for AFP continues to grow.

AFP client implementations are available from Apple for the following computers:

Operating System	Computers	Product	AFP Version
• Macintosh OS	Macintosh (512k Enhancedlater models)	AppleShare client	1.1 or 2.0
• MS-DOS	IBM PC, XT, AT, Compatibles	AppleShare® PC*	1.1 or 2.0
• ProDOS® 8	Apple IIe	Apple IIe Workstation**	2.0
• ProDOS 8 & 16	Apple IIGS	Apple IIGS Workstation	2.0

* Requires LocalTalk® PC Card for physical connection
** Includes interface card for physical connection and AFP client software.

Any of the above AFP client implementations can be used with any AFP-compatible server, as long as the client and the server support the same version of AFP.

AFP-compatible servers are available from the following vendors:

Vendor	Product	Server Platform	AFP Versions Supported
• Apple Computer	AppleShare File Server 2.0	Macintosh	1.1, 2.0
• Novell	NetWare for Macintosh	80286, 80386	1.1
• Alisa Systems	AlisaShare	VAX VMS	1.1
• Pacer Software	PacerShare	VAX VMS	1.1
• Information Presentations Technologies (IPT)	uShare	UNIX, A/UX®	1.1
• EDi Computer Systems	MACLAN Connect	80286, 80386	1.1
• DayStar Digital	FS100	80286, 80386	1.1

Evaluation Factors

When you choose or recommend a file server, you should consider these things:

Existing environment. Current workstations and networking equipment will help determine which server is best for a customer. For new server installations and for installations in predominantly Macintosh environments, AppleShare is probably the best choice; if the customer already has a 3Com or Novell server, then that is probably the best solution.

Total number of authorized users. The total number of users accessing the system will affect the required storage, and, therefore, the optimal server.

Total number of concurrent users. This also affects the choice of a file server, but it has a more direct effect on the amount of processing power needed.

Type of applications. Some applications are more demanding on file server resources. HyperCard® software, accounting packages, and database applications (especially if they are graphics oriented) require higher performance file servers.

Importance of data. If the company depends on the information stored on the file server, then reliability and uninterrupted file server access are more important. Extremely high reliability is available with "fault tolerant" systems and redundant file server hardware.

Security. If sensitive information is stored on the file server, then a more secure system is probably required. Dedicated file servers provide a higher degree of security than background servers.

AppleShare File Server v. 2.0

AppleShare File Server software v. 2.0 is Apple's file sharing software. AppleShare uses a Macintosh computer as a dedicated file server for Macintosh, MS-DOS, and Apple II clients.

The AppleShare File Server software will run on a Macintosh Plus, Macintosh SE, Macintosh II, or Macintosh IIx computer. Because AppleShare uses a standard hardware platform, users already know about the hardware setup, operation, and user interface. And because AppleShare runs on all Macintosh computers with 1 megabyte or more, of memory users can choose a hardware platform that matches their performance requirements and their budget.

AppleShare is a high-performance, dedicated file server that will support up to 50 concurrent users when a Macintosh II or Macintosh IIx with more than 1 megabyte of memory is used as the server platform. AppleShare software is implemented as an interrupt- or request-driven server, so a "foreground" task, such as a mail or print server, can run concurrently. The ability to run a concurrent application gives users greater value and flexibility.

The AppleShare File Server software works just like any Macintosh application, making server installation and administration easy. The server software is installed using the standard Macintosh Installer, with which most administrators will be familiar. After the server software is installed, the AppleShare Admin application is used to add users, create groups, and assign users to groups, create server reports, and so on. The Admin application uses the Macintosh graphic interface and "click and drag" technique to make server administration easy.

The administrator can generate two kinds of reports to help with server administration. The Server Report lists users, the groups they belong to, and (optionally) how much storage space they are using on each server volume. The Volume Report lists the folders on a volume, the access privileges assigned to each folder, and (optionally), the files contained in each folder.

Administrators can back up server volumes, including access privileges, by using utilities written to work with AFP servers, such as Network DiskFit from SuperMac.

The AppleShare file server, like all AFP servers, provides powerful access control over the information stored on the server. Each user can assign access privileges to folders that they create on the server. For a particular folder, the ability to see folders within that folder, to see files within that folder, and to make changes to the contents of that folder, can be given to only the owner, to a group of users, or to everyone on the network.

AppleShare Workstation Software version 2.0 is now included with the Macintosh system software at no additional cost. This allows every Macintosh computer to be used with any AFP-compatible file server from any vendor.

MS-DOS clients require AppleShare PC software and a LocalTalk PC Card to access the AppleShare file server or other AFP server. AppleShare volumes are accessed with a drive identifier (D:, E:, and so on), and are used like any other MS-DOS volume. AppleShare PC also gives MS-DOS users the ability to transparently print to the LaserWriter® printer.

Apple IIe computers require the Apple IIe Workstation Card (which includes Apple IIe workstation software) to connect to an AppleShare file server, and Apple IIGS computers require Apple IIGS Workstation Software.

Novell NetWare for Macintosh

Novell is a successful PC LAN vendor, with 40 percent to 60 percent of the PC network market. NetWare for the Macintosh is a $200 add-on product that provides full AFP compatibility for Novell servers running Advanced NetWare version 2.15 on Novell dedicated servers. Macintosh clients can connect to a Novell server over LocalTalk™ or Ethernet cabling. If LocalTalk cabling is used, a LocalTalk interface card is required for the server.

NetWare for Macintosh lets Macintosh computers be easily integrated into the more than 220,000 NetWare systems installed.

Because Novell NetWare for Macintosh is fully AFP-compatible, it offers all of the benefits of AFP file service: log-on through the Chooser, integration with the Macintosh Finder™ (grayed folders, drop boxes, and so on), and access privileges with either the Get Privileges command in the Finder or the Access Privileges desk accessory.

Novell offers many features in addition to AFP compatibility, including additional security features, connectivity to a wide range of PC network topologies, system fault tolerant (SFT) features (to improve data integrity and reliability), and support for OS/2 workstations. However, all of these features come with a price, and that price is complexity. It is significantly more difficult to install a Novell server than an AppleShare server, especially for users who are unfamiliar with MS-DOS.

NetWare for Macintosh is appropriate for customers who already have NetWare installed, have high security or data integrity requirements, require OS/2 support, or need to support more than 50 users logged in at the same time.

TOPS

TOPS, the product, is software for Macintosh and MS-DOS computers that creates a background server on an AppleTalk network. TOPS, the company, is a subsidiary of Sun Microsystems.

As mentioned, TOPS is a background server; you don't have to dedicate a computer. However, TOPS does not support AFP. Instead it uses a proprietary protocol that has some of the features of AFP. The Macintosh version supports the shared environment features of the Hierarchical File System, but is not AFP compatible at the user-interface level or the protocol-interface level. The results are as follows:

- TOPS won't work with next-generation network software that is written specifically for AFP server environments.
- TOPS doesn't support log on through the Chooser.
- TOPS doesn't use the Access Privileges desk accessory or the Get Privileges command in the Finder.
- TOPS isn't compatible with any AFP server or client implementations.

TOPS claims in its literature that its "distributed file service" offers performance superior to that of dedicated servers such as AppleShare in the areas of economy, reliability, and performance.

When used in a background server environment, TOPS is less expensive for very small networks; however, each TOPS connected Macintosh requires the $249 software product. In contrast, AppleShare client software is provided free with system software, so there is no additional cost to add additional users to the system, up to 25 users (Macintosh Plus or SE), or 50 users (Macintosh II or IIx).

TOPS asserts that a team of background servers is more reliable than one central, dedicated server because if there is only one server, and that server becomes unavailable, then no one has file service. However, when a TOPS server crashes, unless the information on each server is kept identical, the effect is the same for users of that information. In addition, background servers are inherently more prone to loss of data, because they run applications software in addition to file server software, and they interact more with users. If a workstation crashes, clients of that workstation's background server will lose data. With a dedicated server, workstation crashes cannot cause server data loss

Finally, TOPS claims to provide better performance with distributed file service, but a neglected consideration is the performance of the host workstation providing file service. Generally, a single client can degrade the performance of a TOPS server by 38 percent; a second client by as much as 50 percent.

Because TOPS is not AFP compatible, TOPS users don't get the advanced privacy features of AppleShare, Novell, or any other AFP server. TOPS users can restrict access to volumes they make available to other network users, but they can only assign read or read-write access to a folder, and they have to assign a password for each folder. Additionally, all information inside a folder will be made available when that folder is published.

In conclusion, TOPS is a good entry-level networking product for small (2 to 4 nodes with no plans to grow) networks when only occasional file transfer is necessary.

3Com 3+Share for Macintosh

3Com's Macintosh and MS-DOS server product consists of an 80186-based dedicated hardware server called 3Server model s400, running 3+Share software version 1.3.1 and 3+ Mac for Macintosh clients. Until recently, 3Com has not supported AFP as the standard for integrating Macintosh, PCs, and other computers. The resulting products were inconsistent and confusing for Macintosh users.

3Com's current products don't support any of the features of AFP, including logon and authentication methods, access privileges, and graphic display of access privileges.

But 3Com has announced that it will support AFP in future versions of 3+. Until those products are available, 3+ should be recommended only to current 3Com customers who want to integrate Macintosh into their existing system.

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Chapter 2 **Introduction**

Reliability

The tremendous gains in productivity that result from people working together, sharing information, and leveraging each other's results can only occur if people make use of the technology that empowers them. To do so, they need a high level of confidence in the technology. Inability to access shared information or permanent loss of information–both possible when information is at the mercy of the user of the workstation/server–can cripple a workgroup's ability to achieve the desired results.

Dedicated file servers are constantly available for access by any authorized user on the network. It is also easier to economically justify reliability enhancements, such as an uninterruptible power supply (UPS), to allow the server to continue running during a power failure so that it remains available for remote members of the team who are not affected by the power loss.

Availability of information stored on background servers is subject to the behavior of the user of the "host" workstation. If the workstation is not turned on or if the owner has not properly set up security for a file, the information is not available.

Most personal computer applications in use today were not designed to share processing power, and can generate conflicts with the background server program. As the user of the workstation/server adds customizing software, particularly desk accessories or "terminate and stay resident" utilities, the potential for conflict–and failure–increases. If a workstation/server has a problem, such as an application crash or "bomb," clients of the background server can lose data. Also, the user of the workstation/server may simply forget and turn the server off on the way out of the office, leaving other users of the background server unable to save their work.

Any of these situations can be disastrous for a file server user who is involved in critical projects on tight deadlines.

Administration

It is a misconception that any type of file service does not require some level of administration. The level of responsibility required varies depending upon the complexity of the service, the number of users, the size of the network, and the importance of the service to the organization.

Just as a certain set of minimum skills is required to use a workstation responsibly, a certain minimum set of administrative skills and procedures is required for reliable and consistent operation of a network. A powerful, dedicated server allows one or two individuals to be trained to administer shared information for an entire organization. Although background servers can be convenient for casual information exchange, use of multiple nondedicated servers for sharing critical data can result in administrative difficulties that outweigh the anticipated benefits of sharing.

The "human factors" issues involved in network usage and administration point out the benefits of centralized administration. The following administrative responsibilities can be handled more simply and effectively when administration takes place at a single point:

- **Backup.** All computer systems are imperfect, and there are also natural disasters and accidents to contend with. Although many organizations "get away" with inconsistent backup procedures, the backup of all data, especially information produced through the cooperative efforts of several workers, will become more and more critical as networks become increasingly important to the basic operation of the organizations that use them.

Dedicated servers allow administration to be centralized, so that regular backup of all of the organization's data can be achieved. This is much more difficult with nondedicated servers, because the information is physically stored in highly accessible workspace locations and backup is left to individual users who may have no investment in the data. It is more difficult to keep track of who has or has not performed backups, and when they occurred, than to have a clearly designated administrator with responsibility for the task.

■ **Storage management.** There are two major issues involving storage management on file servers: managing the available storage for users; and organizing server volumes.

Shared disks in a network file service environment are not static; information and programs are added and deleted daily. Storage requirements tend to increase over time. Large databases and graphics-intensive applications such as HyperCard exacerbate this problem. Since no organization can afford an infinite amount of storage, it is important to manage available storage capacity by removing obsolete or redundant programs and data, adding new storage early enough, and so on.

Care must also be taken to organize the information on shared server volumes in a manner that makes sense for all users. Productivity gains resulting from workgroup efficiencies can be completely offset if users must search through poorly organized server volumes for the information they need. Restricting the freedom of the workstation/server user to reorganize a hard disk volume can also lead to conflict.

Clients of a particular server must have adequate storage available and be able to locate the information they need. From a practical standpoint, background servers make enforcing responsibility for the management of available storage and server volume organization very difficult. A powerful server with a designated administrator is more effective.

■ **User authorization.** Keeping track of which users or groups of users should have access to a set of files and which users belong to which groups is frustrating–if not impossible–when every server has its own administrator. The simplified administration that accompanies a dedicated server installation not only allows greater consistency throughout the network, but also unburdens the users from the need to maintain lists of passwords and respond to other users' requests for access.

■ **Maintenance.** Servers need to be "brought down" periodically for hardware maintenance, software updates, backups, and so forth. Centrally administered servers allow better coordination of maintenance operations with the file service needs of the organization.

■ **Version control.** System software and applications programs are also not static; system software vendors provide periodic updates to improve performance, functionality, and reliability. Many popular applications software packages are updated once or twice a year in response to system software updates, bug fixes, or general upgrades. Multiple versions of system software, peripheral drivers, and applications software on the network can cause inconveniences, such as the need to reinitialize printers, or more serious problems, including data loss.

As the number of software programs increases and system software becomes more sophisticated, testing for all possible combinations of version conflicts–and troubleshooting the types of problems that they can cause–becomes increasingly difficult. A full-time, universally accessible server with access controls provides a convenient focal point to ensure that these updates occur consistently for everyone on the network, allows distribution of selected combinations of products based on user needs, and helps avoid the problems that can be created by version conflicts.

- **Troubleshooting.** When network users encounter a problem, they need to know who in their organization is responsible for helping them. In the case of a background server, the "administrator" is probably another user, who may or may not be able, willing, or even around to help.

When problems occur, someone trained and knowledgeable must investigate and coordinate troubleshooting. Often there are recurring problems, such as unplugged cables, bad interface cards, or incompatible software, which are simple to identify once you are familiar with the symptoms. The use of a designated administrator allows troubleshooting experience to be accumulated by an individual on behalf of the organization, so that problems can be located and solved more quickly. One or two people in an organization can be trained and kept up-to-date on administrative and troubleshooting issues. Troubleshooting is much more difficult with multiple servers administered by multiple individuals of varying experience and commitment levels.

Security

Information that is important to an organization and of a sensitive nature demands more security than a background server can provide, and often requires that the server device be placed in a secure area, such as the data center or computer room, or even a locked equipment closet. Under such circumstances, allowing a user to run applications on the server is out of the question. Many organizational security programs cannot tolerate the assignment of access passwords being determined by the whim of the workstation/server user.

With a dedicated server, the server computer and its disks can be physically locked away. Data can only be accessed over the network as allowed by passwords and security mechanisms controlled by the network administrator.

Information Updates

When using background servers, important data can be physically dispersed around an organization. Copies of the same information can multiply without the knowledge of some users. This can cause serious problems if the information must be up-to-date. Administration in this case is much more difficult than the automatic maintenance enabled by centralized databases on dedicated file servers.

Performance

Workstation Performance

File service requires CPU cycles, memory, and disk I/O, and can place very high demands on the server device. With a dedicated server, all of the server device's power and resources are available for performing network services. In the case of a nondedicated server, however, the workstation/server's CPU cycles, memory, and disk I/O processing power must be divided between the foreground user and the background file server application. This means that if your workstation is acting as a server for another user, each time he or she accesses your disk, your work is slowed or interrupted. You are sharing your workstation's memory, processing power, and disk access along with your information. If you are not using your system at the time or are simply transferring a small file, this is not significant. However, background file servers are not appropriate for databases or other applications that require frequent file service, because they can seriously degrade the performance of the host workstation. In fact, working on a background server can be somewhat like having a person repeatedly interrupt your work by barging in unannounced to borrow a file in your desk drawer.

Dedicated servers allow each workstation to retain all of its processing power and workstation memory.

Non-dedicated vs. Dedicated Workstation Performance

Non-dedicated Servers require more memory as well as CPU cycles and I/O bandwidth to complete the file service request of other workstations clients.

Dedicated Servers use less memory and maintain the full performance of each client workstation since no other work-station are using its processor or disk.
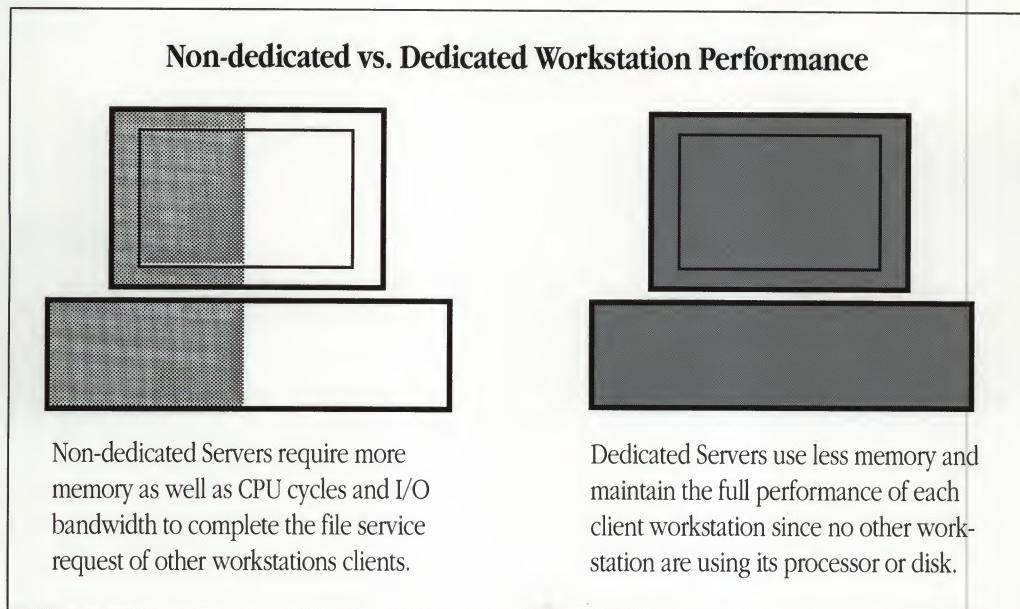
Server Performance

As the previous chart illustrates, a dedicated server can use all of the available memory and processing power of its computer to provide a "wider path" to the information on its disks.

Dedicated servers can also be optimized to provide robust file service for many users. Typically, dedicated server products can support from 25 to 100 users logged in concurrently. Each user requires additional memory. With the amount of "uncommitted" memory available in dedicated servers, larger buffers can be assigned to hold often-used data such as security information. If additional memory is installed, it can be used for caching (keeping frequently accessed disk information in memory) to speed up response to disk access requests. Some file servers use special file systems optimized to provide higher-performance network file service for large numbers of users.

With background servers, buffer sizes and other memory usage must be kept to a minimum to allow room for the host operating system and applications software; therefore, background servers typically can only support a limited number of concurrent users. For example, TOPS background servers can support a maximum of 10 concurrent users. Since personal computers are designed primarily to provide good response to the user, actions such as typing on the keyboard are given very high priority by the system software. Continuous data entry on a workstation/server can seriously degrade server response for other users.

Background server software must be designed to "interleave," or share processor time, with the applications software and other tasks that may be running on the workstation. In general, design decisions and "trade-offs" must be made to maximize the host workstation's resources, resulting in a compromise of performance for background server clients.

Cost

Nondedicated servers can be cost-effective in very small networks. But when background server products are sold on a price-per-workstation basis, a dedicated server can actually be less expensive in configurations of more than five or ten workstations. And because, in many cases, the deteriorating performance of a background file server as the workgroup grows forces users to dedicate the server, the background server cost advantage disappears beyond two or three workstations. Even in small workgroups, the performance and convenience of a dedicated server can justify the investment.

Dedicated servers and nondedicated servers do not provide the same level of service for all applications, and the decision as to which one to use should not be made on the basis of purchase price alone.

Summary

For occasional file transfer or sharing of nonessential data, background servers can be a convenient solution. However, for serious database operations and other important applications, a dedicated server offers better performance for a larger number of users. In a secure location, under the supervision of a trained administrator, a dedicated server will also be more reliable and easier to administer than multiple background servers.

No single file server product is the best solution for every application. There are however, some general guidelines that may be helpful:

- A non-dedicated or background server is probably appropriate in the following situations:
  - The information being shared is not critical to the organization.
  - Security is not a major concern.
  - Fewer than 4 (with no plans to grow) concurrent users are typically active.
  - Separate, uncoordinated updating of multiple copies of the same information is acceptable.
  - Performance requirements are low.

- A dedicated server is probably appropriate in these situations:
  - Shared information is critical.
  - Effective security is required.
  - More than 4 concurrent users are typically active.
  - Centralized databases must be kept up-to-date.
  - Higher performance is required.
  - Client data loss due to workstation/server user error is unacceptable.

The AFP Standard

The AppleTalk Filing Protocol (AFP) is the industry standard for AppleTalk Network System file service. To better understand its significance, it is important to answer these questions:

- What is AFP?
- What does AFP compatibility really mean?
- Why is AFP compatibility important for users?
- What type of industry support is there for AFP as a standard?
  - Which computers work with AFP?
  - Which network vendors support the AFP standard?

AFP is Apple's standard for file service on AppleTalk networks. It allows the transparent sharing of files between different computers and operating systems. AFP supports file service for Macintosh, MS-DOS, Apple IIe, Apple IIGS, VAX VMS, and UNIX computers.

There are two sides to the AFP standard: the server and the client. All AFP servers accept and process the same network calls, as defined in the AFP protocol specifications. Currently, there are products available based on each of two AFP versions: 1.1 and 2.0. Version 2.0 includes extensions for the support of Apple IIe and Apple IIGS computers.

Each client computer requires appropriate network hardware and client software to access the server. The client software acts as a translator between the computer's native file system and the AFP protocol. The AFP protocol was designed to be broad enough to support the features of most popular operating systems. The following is a simplified model of the major components of AFP file service:

Simplified Model of AFP File Service

Server	Client
DISK DRIVE	Application
Server File System	Native File System
AFP Server Software	AFP Client Software
Apple Talk Protocol Stack	Apple Talk Protocol Stack

← ATP →

Apple Talk Network
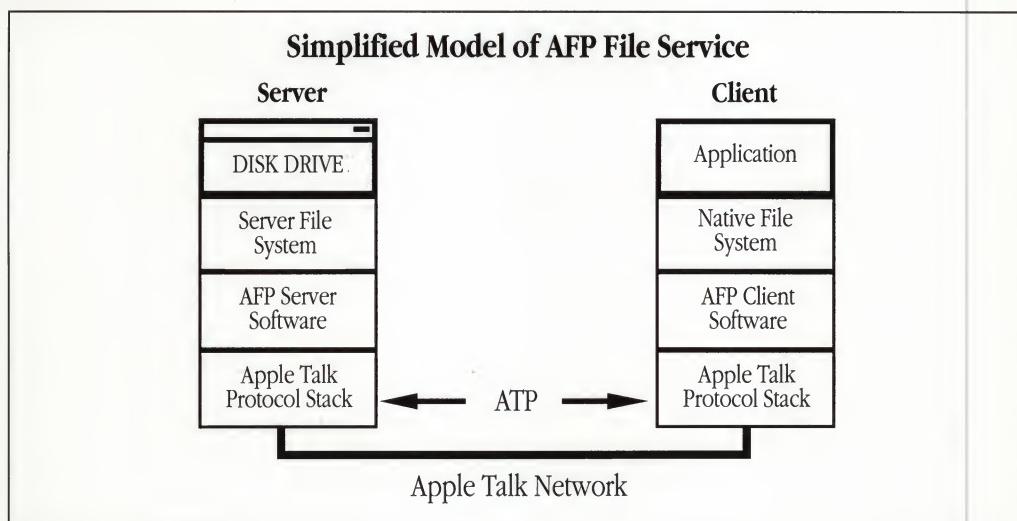
What does AFP compatibility really mean?

Products may be AFP compatible at the server side or the client side.

AFP-compatible servers support all the required features of the AFP protocol standard version 1.1 or 2.0, including user authentication methods, access controls, and long and short name maintenance. They connect to networks that support AppleTalk Network System protocols and media such as LocalTalk, EtherTalk™, and LANSTAR™. They register their types and names using the AppleTalk Name Binding protocol and appear in the Chooser desk accessory of AFP-compatible workstation clients. All AFP-compatible server implementations should work with all AFP compatible client implementations.

On the client side, there are three levels of compatibility:

■ User interface. The client software supplied with the AppleShare product embodies Apple's standard for the user's "view" of file service. An AFP-compatible server will work with this standard AFP client software. Recognition in the Chooser as an AFP server, the log-on process, the Access Privileges desk accessory, and the appearance of mounted volumes on the desktop are all part of this standard user interface. Products that do not offer these user-interface features are not AFP compatible.
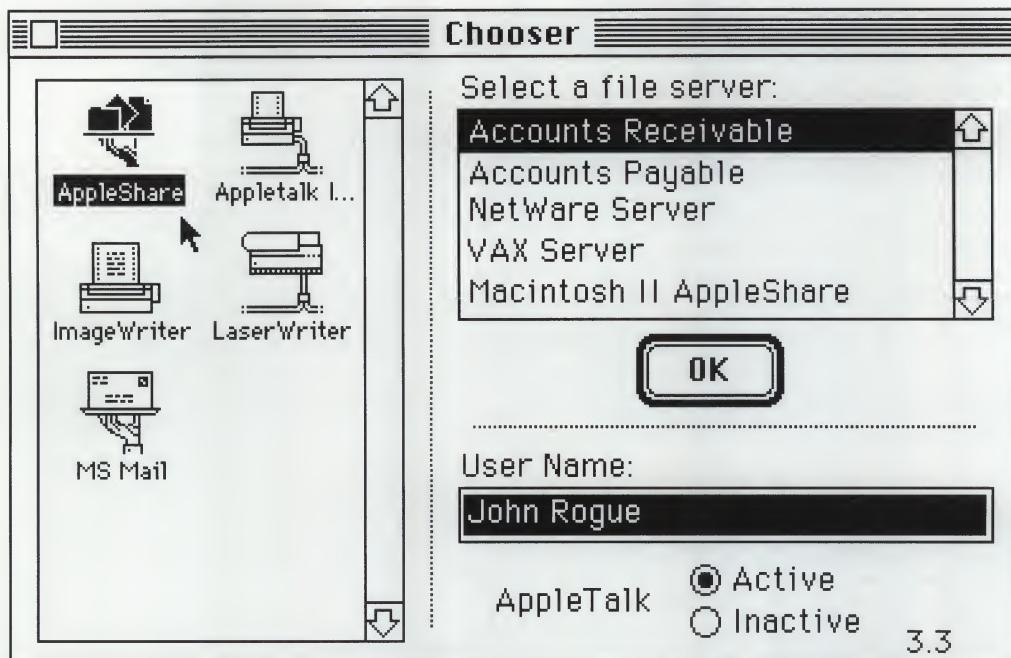
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│ ▤□  ═══════════════════ Chooser ═══════════════════       │
├──────────────────────────────────────────────────────────┤
│  ┌─────────────────────┐ ⬆   Select a file server:        │
│  │   📁↰        🖨       │     ┌──────────────────────┐⬆  │
│  │                      │     │ Accounts Receivable  │   │
│  │ AppleShare  Appletalk I…    │ Accounts Payable     │   │
│  │                      │     │ NetWare Server       │   │
│  │   🖨         🖨        │     │ VAX Server           │   │
│  │                      │     │ Macintosh II AppleShare│⬇ │
│  │ ImageWriter LaserWriter     └──────────────────────┘   │
│  │                      │          ┌──────────┐           │
│  │   ✉                  │          │    OK    │           │
│  │                      │          └──────────┘           │
│  │  MS Mail             │     User Name:                  │
│  │                      │ ⬇   ┌──────────────────────┐     │
│  └─────────────────────┘     │ John Rogue           │     │
│                                                           │
│                    AppleTalk  ◉ Active                    │
│                               ○ Inactive    3.3           │
└──────────────────────────────────────────────────────────┘
```

AFP servers have powerful features to ensure the security and privacy of information on shared server volumes.

When a registered user creates a folder on an AFP server he or she is called the owner of the folder. The owner or administrator can allow other users to access a folder by assigning access privileges to their group(s) or to everyone (public).

Access privileges are the method that AFP servers use to provide privacy of information on the server. There are three basic access privileges that the owner or administrator controls for the Owner, Group, or Everyone:

	Owner	Group	Everyone
See Folders:	☒	☒	☐
See Files:	☒	☒	☒
Make Changes:	☒	☐	☐

The above example shows a file to which the owner has full access. The members of a group have the ability to see files and folders but not make changes. And everyone else on the server can see only the folders — they can not see the files within or make changes.

- **See Folders** – the privilege to see other folders (if any) in the folder.
- **See Files** – the privilege to see files (documents and applications, if any) in the folder, as well as to open and copy any of those files (unless copy-protected).
- **Make Changes** – the privilege to make changes to the folder's contents, including creating, moving, or deleting files and folders (unless a folder nested inside the folder has access privileges that don't permit you to make changes to it, or a file or folder nested inside the folder is locked).
    - **Owner** — Creator of the information.
    - **Group** — Any AppleShare group that's been set up by the administrator.
    - **Everyone** — Every user with access to a server.
- **Operating System**. AFP client implementations take native file system requests and translate them to AFP-compatible file service requests. On the IBM PC, this means compatibility with the standard MS-DOS Redirector from Microsoft. For the Macintosh, this means compatibility with the File Manager, Hierarchical Filing System (HFS), and Finder™. Apple's AppleShare client software, distributed with standard Macintosh system software, eliminates the need for AFP-compatible server vendors to write their own Macintosh client software.
- **File Service Protocol Interface.** Applications programs may make two types of calls relating to file service:
    - Native file system calls, including byte range or record locking, extended open such as read only, or other shared environment-oriented calls
    - Calls specific to network file service. In the case of MSDOS these may be Redirector or NetBIOS calls Macintosh calls may be made directly to the AFP or ASP (AppleTalk Session Protocol) layers of the AppleTalk Manager, which handle file service.

Macintosh/Apple		MS-DOS/IBM
Chooser Access Privileges Mounted Volumes	User Interface	Vendor Dependant
Finder File Manager HFS (File System)	Operating System Interface	DOS Redirector MS-DOS 3.x, 4.x File System
AFP (Apple Talk Manager	Network Protocol Interface	NETBIOS

Compatibility with native file system calls is adequate for most current-generation applications software. However, network-specific software and next-generation "network-aware" applications will increasingly take advantage of the extended features of these network interfaces. Client implementations that fail to take this into account will become incompatible with these applications.

AFP compatibility is important to computer users, because it provides the following benefits:

- **Standard user interface.** Apple's AFP client software provides a standard user interface for workstation users independent of the server manufacturer. New servers and network services can be added without requiring additional user training.

■ **Product compatibility.** AFP is the standard for the Apple development and user community. It is widely supported by network vendors, software developers, and other computer products manufacturers.

■ **AppleTalk Network System compatibility.** Because AFP is built upon the foundation of the AppleTalk Network System, users also gain the many advantages of Apple's standard networking environment. These include support for different network cabling, including twisted-pair, fiber-optic media, and Ethernet coaxial cable, simplified network administration, and advanced networking features such as zones, bridges, and gateways to other networking environments.

■ **Broad connectivity.** Many major vendors in the computer industry support the AppleTalk Network System and AFP file service. Apple is committed to transparent support of the most popular personal computers, minicomputers, and mainframes–now and in the future.

What type of industry support is there for AFP as a standard?

AFP is built upon the AppleTalk Network System, which, by virtue of its installed base of over 1 million nodes, is now one of the top networking standards. More than 60 percent of the Macintosh computers installed are connected to AppleTalk networks; most of these are located in business and university environments. Apple has also recently released connectivity products for the Apple IIe and Apple IIGS computers, which account for 70 percent of the computers used in education. AppleTalk and AFP 2.0 are well on their way to becoming the standard for educational networks.

AFP-compatible server implementations are now available for most major computing platforms, and most popular workstations have AFP client capability directly from Apple or third parties. The major MS-DOS network vendors, Novell and 3Com, will provide full support for AppleTalk and AFP file service. Apple's strategic alliance with Digital Equipment means even closer integration of AFP and other AppleTalk network services with the popular VAX family of computers. Alisa Systems and Pacer Software offer AFP server implementations on the VAX today. Industry support continues to grow.

AFP client implementations are available now for the following computers:

■ Macintosh
■ PC, PC/AT, PS/2™ MS-DOS compatibles
■ Apple IIe (ProDOS 8)
■ Apple IIGS (ProDOS 8 and 16)

AFP-compatible server implementations (Company, Product, Computer, Protocol):

Vendor	Product Platform	Server supported	AFP Versions
• Apple Computer	AppleShare 2.0	Macintosh	2.0
• Novell	NetWare for Macintosh	80286,80386	1.1
• Alisa Systems	AlisaShare	VAX VMS	1.1
• Pacer Systems	PacerShare	VAX VMS	1.1
• Information Presentation Technologies	uShare	UNIX, A/UX	1.1
• EDi Computer Systems	MACLAN Connect	80286,80386	1.1
• DayStar Digital	FS100	80286,80386	1.1

Chapter 3   File Server Reports

AppleShare 2.0
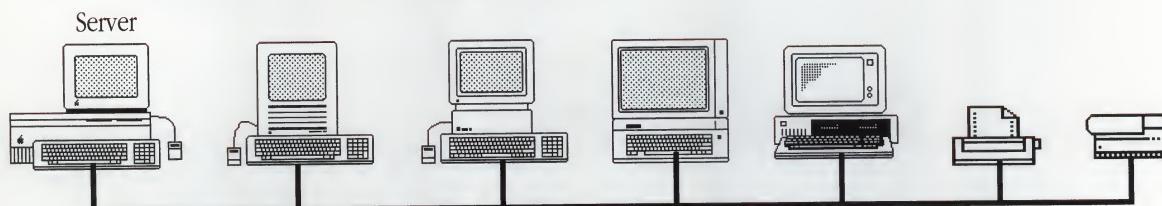
Server

At a glance...

Type of Server:	Dedicated
Hardware Platform:	Macintosh
Server Software:	AppleShare 2.0
Macintosh Client Software:	Apple AFP client software—included with Macintosh system software
MS-DOS Client Software:	AppleShare PC
Concurrent Users:	25–50
AFP Compatibility:	Version 2.0—100%

AppleShare 2.0 is Apple's software product that converts a Macintosh into a powerful dedicated file server for AppleTalk networks. It allows the three most popular personal computer types— Macintosh, Apple II, and MS-DOS systems– to transparently store and share documents, folders and applications in a workgroup environment. AppleShare is designed to be a dedicated resource to network users. This provides many advantages in reliability, security and performance. The AppleShare file server may provide several network services simultaneously, including print spooling or electronic mail.

AppleShare 2.0 conforms to version 2.0 of the AppleTalk Filing Protocol (AFP) specifications. Because of this the user enjoys the support of the Apple II, as well as Macintosh and MS-DOS systems. AFP compatibility also provides powerful access controls to information stored on the server, compatibility with any AFP server or client implementations and compatibility with next-generation network software that is written specifically for AFP server environments.

AppleShare Workstation Software version 2.0 is now included with the Macintosh system software at no additional cost. This allows every Macintosh computer to be used with any AFP-compatible file server from any vendor.

MS-DOS clients require AppleShare PC software and a LocalTalk PC Card to access the AppleShare file server or other AFP server. AppleShare volumes are accessed with a drive identifier (D:, E:, and so on), and are used like any other MS-DOS volume. AppleShare PC also gives MS-DOS users the ability to transparently print to the LaserWriter® printer.

Apple IIe computers require the Apple IIe Workstation Card (which includes Apple IIe workstation software) to connect to an AppleShare file server, and Apple IIGS computers require Apple IIGS Workstation Software.

The AppleShare file server can run on the Macintosh Plus, Macintosh SE, Macintosh II, and Macintosh IIx. Using a standard Macintosh as a server platform has many advantages:

- Users are already familiar with the hardware setup, operation, and user interface.
- The Macintosh family line offers incremental performance improvement. The Macintosh SE offers a 20 percent improvement in processing power and significantly faster disk access than the Macintosh Plus. The Macintosh II offers four times the processing power of the Macintosh SE and disk access speed of over 1 megabyte per second. Users can start with a lower-cost Macintosh, such as the SE, and move up in performance to a Macintosh II or IIx when necessary without losing their hardware investment, since the superseded Macintosh can be used as a workstation.
- Because Macintosh workstations and AppleShare servers use the same hardware, no special service contracts or other arrangements need to be made for specialized server hardware.

AppleShare supports 25 concurrent users with 1 megabyte of memory and a standard 68000 processor (Macintosh Plus or SE). If 2 megabytes or more of memory and a 68020 or 68030 processor are available (Macintosh II, IIx, or SE with accelerator), AppleShare will support up to 50 concurrent users.

AppleShare is a high-performance server. Since it is a dedicated server, the entire memory and processing power of its host computer can be utilized for file service. Sophisticated caching techniques are used to speed up disk access and retrieval of common information such as access privileges. A Macintosh II with 2 megabytes or more of memory and Apple's 28-millisecond 80-megabyte disk is comparable to the fastest 80386-class servers available. The Macintosh IIx with its 68030 microprocessor, will achieve even higher performance.

AppleShare software is implemented as an interrupt or request-driven server. This allows a "foreground" task, such as a mail server, to run concurrently, offering greater value and flexibility.

Backup of server volumes, including access privileges, may be accomplished by using utilities optimized for AppleShare, such as Diskfit from SuperMac and Irwin Magnetics hard disks and tape backup software.

Product Summary

Product	Description	
AppleShare 2.0	Server,Administration and Workstation Software	
AppleShare Client	Macintosh AFP Client Software	(included w/ Macintosh System Software)
AppleShare PC	MS-DOS AFP Client Software	
LocalTalk PC Card	PC XT/AT-Compatible Interface Card	
LocalTalk Connector Kit	Standard Connector, Cable Kit	

AppleShare Server Installation

One of the most appealing features of AppleShare is the simplicity of its installation. The basic steps are as follows:

1. Use the standard Installer and select the "AppleShare File Server 2.0" script.
2. Run the AppleShare Administration application
   - Click "Prepare volume for use with AppleShare"
   - Assign the Server name and "Admin Key" (master password)
   - Add Users and Groups

AppleShare can also be installed on an existing hard disk containing files. In that case, you would not initialize the disk, and those files could be made available to workstations on the network.

User Authorization and Organization

There are two types of users on AppleShare servers:

- Registered users have their names on a list created by the AppleShare administrator. They have a password and can access information on the server as controlled by access privileges.

- Guests are users who can access the server without being on the registered user list or using a password. They may access only information that is "public" and any files that they save on the server are accessible to all users. Guest access can be disabled by the administrator if the administrator does not want casual browsers logged on to the server.

Registered users may be organized by the administrator into groups, making it possible for users to limit access to the information in their folders to the members of a specified group. Each user who is assigned to a group has a primary group that reflects his or her most common "association" with other users and the information they typically access. When a user creates a folder, the primary group is automatically entered as the group of users to which he or she may want to give access privileges. Of course, the owner of the folder, has the option of excluding the primary group or changing the group completely.

Privacy

AppleShare and all AFP servers have powerful features to ensure the security and privacy of information on shared server volumes. AFP servers extend the concept of security by giving the individual personal control over their information. Only the owner decides who else gets to use it. For example, while you're developing a report, you can store it on a file server and keep it in a private folder so no one else knows the report is there, and no one else can open it, read it, or make changes to it. When you're ready to make the report public, you can instantly make it available to any user who has access to the file server.

When a registered user creates a folder on the AppleShare server, that user is the owner of the folder. Initially, only the owner of a folder has access to it. The owner allows other users to access the folder by assigning access privileges to them.

Access privileges are the method that AFP servers use to provide privacy of information on the server and are assigned at the folder level. There are three basic access privileges—See Folders, See Files, and Make Changes—which the owner or administrator can assign to any of three designated categories—Owner, Group, or Everyone

```
                           Owner    Group   Everyone
          See Folders:       ☒        ☒        ☐

            See Files:       ☒        ☒        ☒

         Make Changes:       ☒        ☐        ☐
```

The above example shows a file to which the owner has full access. The members of a group have the ability to see files and folders but not make changes. And everyone else on the server can see only the folders — they can not see the files within or make changes.

- **See Folders**—The privilege to see other folders (if any) in the folder.
- **See Files**—The privilege to see files (documents and applications, if any) in the folder, as well as to open and copy any of those files (unless they are copy-protected).
- **Make Changes**—The privilege to make changes to the folder's contents, including creating, modifying, moving, or deleting files and folders (unless a folder nested inside the folder has access privileges that don't permit you to make changes to it, or a file or folder nested inside the folder is locked).

- **Owner** — Creator of the information.
- **Group** — Any AppleShare group that's been set up by the administrator.
- **Everyone** — Every user with access to a server.

Administration

All servers require some degree of administration, however some are more difficult than others. AppleShare is easy to administer because the software is consistent in operation with other Macintosh applications. The administrator does not have to learn any new commands or procedures than they already know, to operate their own Macintosh. And because the server is dedicated, administration can take place at a single point making it much easier and more effective. *For a further discussion on Administration see pages 11 through 12.*

For an AppleShare server the administrators' duties include organizing the files and folders on the server for users, making sure there is enough storage for user files, updating system software and applications, maintaining the users and groups list, troubleshooting, and performing backups. The administrator may perform most functions from the server's keyboard without shutting down the server. This benefits the users on the network by providing nearly uninterrupted file service.

When the AppleShare server is running, the server status window — displayed on the Macintosh screen unless a concurrent application is running — indicates current activity, which volumes exist on the server, and which users are currently logged on. This information is useful, especially if the server must be brought down for some reason. If the server must be brought down, the administrator can use the Shut Down command to issue a warning to each logged-on workstation, stating that the server will shut down after a predetermined period. A warning dialog will then appear periodically on each workstation using the server until the shutdown occurs.

Given training, dealer support, and the excellent, thorough documentation provided with AppleShare, most users make good administrators. Although it is not necessary, many have found it beneficial to complete the network administrator's training course provided by Apple and taught by Apple Desktop Communications dealers.

Server Reports

AppleShare also provides two reports that help the administrator to manage the server and its users:

- The Server Report lists all registered users and details the groups to which they belong. It also tells the administrator how many files and folders each user has in a volume, and how much space those files and folders occupy. This is useful in managing available storage and group organization.
- The Volume Report provides the administrator with information about the folders in a volume, including the names of the files and folders inside each folder, their owner, associated group, and access privileges. It also indicates whether a folder is locked and whether a file is locked or copy-protected.

Each report is available in two versions—complete or summary—depending upon the level of detail needed. The information they provide is helpful in general administration of the server, such as organizing information and managing storage requirements.

Compatibility

AppleShare is 100 percent AFP 2.0 compatible. It adheres to all of Apple's published standards for AppleTalk Network System file service. It works transparently with AFP client software for the Macintosh, AppleShare PC, and other AFP client implementations that adhere to AFP standards. Applications software written to comply with the AFP standard will work properly with AppleShare.

AppleShare Macintosh Client Software

AFP client software is now included with Macintosh system software. This allows every Macintosh workstation to be used with any AFP-compatible file server from any vendor. For example, users may purchase AppleShare or Novell NetWare for Macintosh, AlisaShare from Alisa Systems, PacerShare from Pacer Software or any AFP compatible server as the file server and still use the same client software supplied and maintained by Apple.

Installation

AppleShare Macintosh client software comes standard as part of Macintosh system software. No installation is necessary.

Log-on Procedures

Using the Chooser, Macintosh users select the server that they want to log on to. If their network is organized into multiple zones (using bridges), the zone is first selected. All servers in that zone are then displayed.

```
┌─────────────────────────────────────────────────────────────┐
│ ▤□▤▤▤▤▤▤▤▤▤▤▤▤▤▤▤ Chooser ▤▤▤▤▤▤▤▤▤▤▤▤▤▤▤▤▤▤ │
├─────────────────────────────────────────────────────────────┤
│  ┌──────────────────┬─┐  Select a file server:              │
│  │   📁↘   🖨     │⇧│  ┌──────────────────────────┬─┐    │
│  │                  │ │  │Research Server           │⇧│    │
│  │ AppleShare Appletalk I...│  │Administration Server     │ │    │
│  │                  │ │  │                          │ │    │
│  │   🖨     🖨     │ │  │                          │ │    │
│  │ ImageWriter LaserWriter │⇩│  │                          │⇩│    │
│  └──────────────────┴─┘  └──────────────────────────┴─┘    │
│  AppleTalk Zones:             ╭─────────╮                    │
│  ┌──────────────────┬─┐       │   OK    │                    │
│  │Headquarters      │⇧│       ╰─────────╯                    │
│  │Building 1        │ │  User Name:                          │
│  │Building 2        │ │  ┌──────────────────────────────┐    │
│  │                  │ │  │John Rogue                    │    │
│  │                  │⇩│  └──────────────────────────────┘    │
│  └──────────────────┴─┘  AppleTalk  ◉ Active               │
│                                     ○ Inactive    3.3       │
└─────────────────────────────────────────────────────────────┘
```

The zone of the selected server
(if you're in a zone)

The user name you typed

The server whose volumes
you'll access

```
┌─────────────────────────────────────────────────────────┐
│  ┌──┐                                                    │
│  │  │                                                    │
│  └──┘   Connect to the file server " New Markets  as:    │
│                                                          │
│         ○ Guest                                          │
│         ⦿ Registered User                                │
│                                                          │
│         Name:      ┌──────────────────────────────┐      │
│                    │ John Rogue                   │      │
│                    └──────────────────────────────┘      │
│         Password:  ┌──────────────┐  (Scrambled)         │
│                    │ ●●●●●●●●     │                       │
│                    └──────────────┘                      │
│                                                          │
│       ┌───────────┐  ┌─────────────────┐  ╔════════════╗ │
│       │  Cancel   │  │  Set Password   │  ║     OK     ║ │
│       └───────────┘  └─────────────────┘  ╚════════════╝ │
│                                                   v2.0   │
└─────────────────────────────────────────────────────────┘
```

Once the server is selected, the user logs on either as a guest, if the server allows or as a registered user. Guests, as previously discussed, may only access public folders and files. Registered users use a password to gain access to restricted information on the server. If you are a registered user, you will need to enter your password which is scrambled as it's sent over the network so no one can pick it up through electronic eavesdropping.

The password may be changed by the user at this point. With AppleShare, the individual has the option of changing their password at any time.

```
┌─────────────────────────────────────────────────────────┐
│                                                          │
│   ┌──┐    Please reenter your new password for           │
│   │  │    confirmation.                                  │
│   └──┘                                                   │
│                                                          │
│                                                          │
│                                                          │
│                    ╔════════════════╗                    │
│                    ║      OK        ║                    │
│                    ╚════════════════╝                    │
│                            ▶                             │
│                                                          │
└─────────────────────────────────────────────────────────┘
```
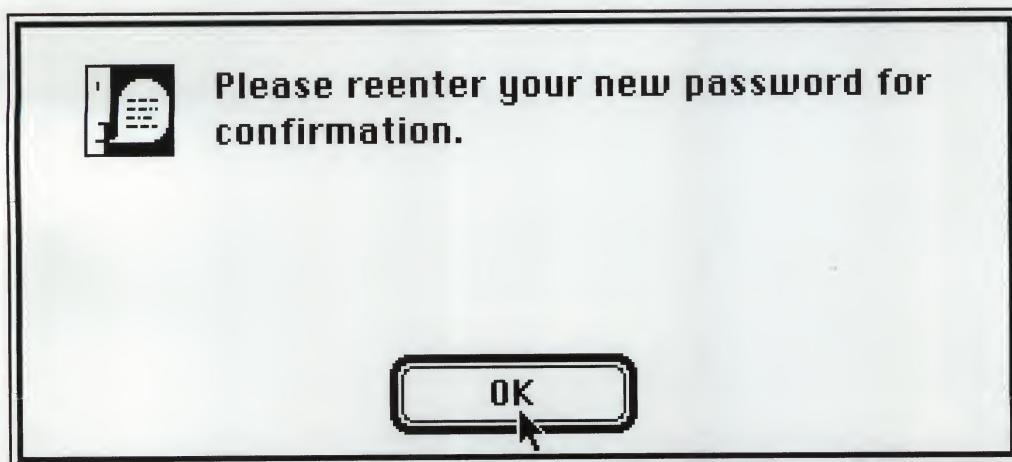
Users may choose to mount one or several server volumes on their desktop. They can also designate volumes to be mounted automatically at boot time so that the process need not be repeated every time.

New Markets

Select the server volumes you want to use:

New Products
Market Research

Checked volumes (⊠) will be opened at system startup time.

Quit   OK

v2.0
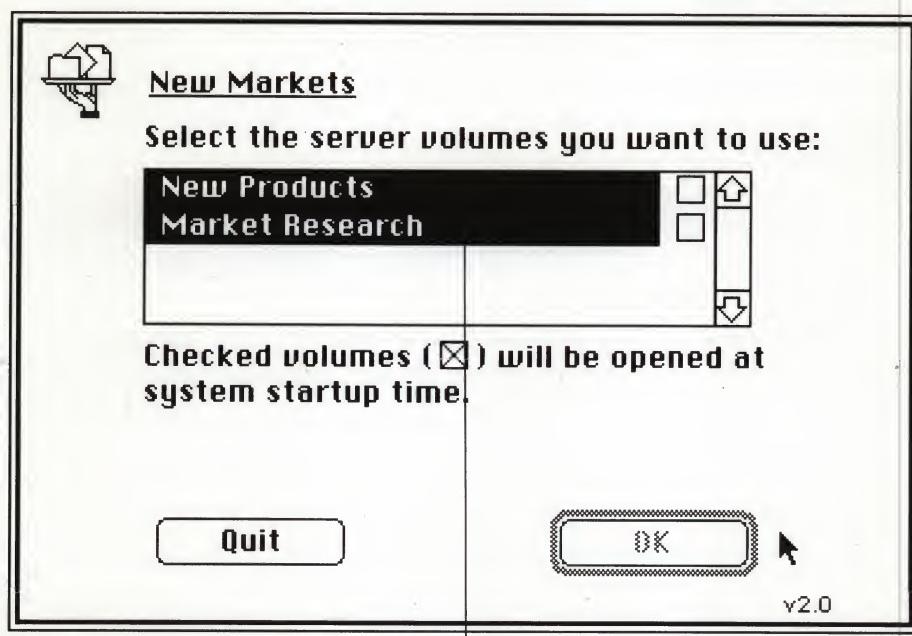
Available volumes selected

The AFP client software supplied by Apple fully integrates file service with the Macintosh user interface. Server volumes behave just like local floppy disks or hard disk volumes.

New Markets

14 items   70,082K in disk   6,821K available

Systems   Peripherals
Accounting   N & C
Product Research   Applications
Appointments N&C   New Projects

Product Research

New Markets

The volume directory window   The volume you opened
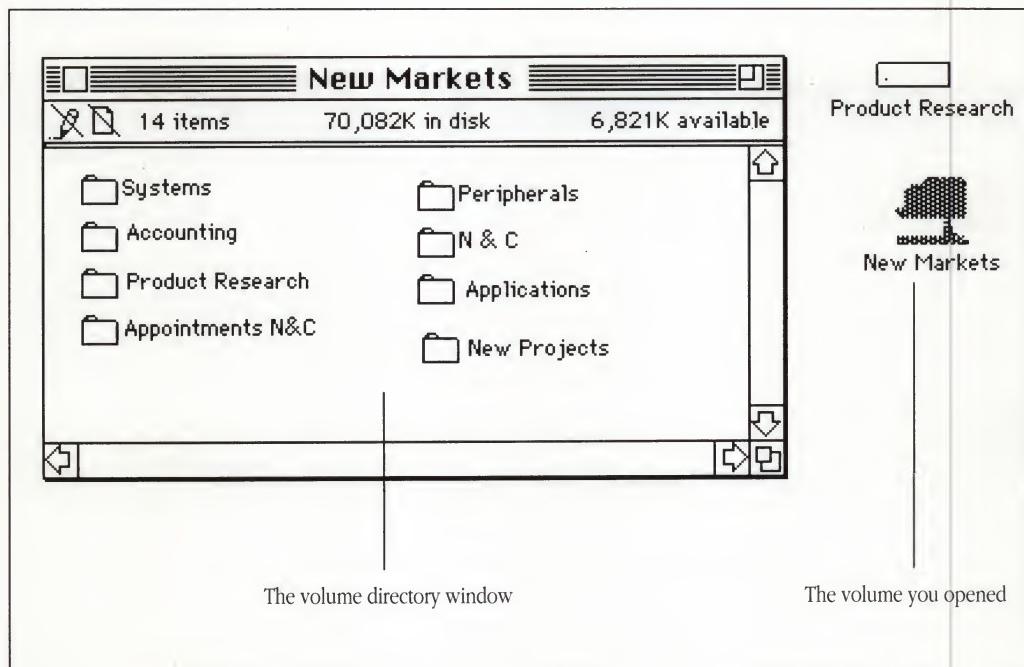
Volumes—and the folders and files they contain—may be used normally by applications. Some applications, such as Microsoft Excel, offer special "read only" open modes to prevent other network users from modifying a file while another user has it in memory. Other applications, such as databases, use the byte range locking and other features of AppleShare to allow multiple users to concurrently access files.

The AFP client software extends the standard Macintosh user interface to indicate the access privileges that a registered user has for particular folders.
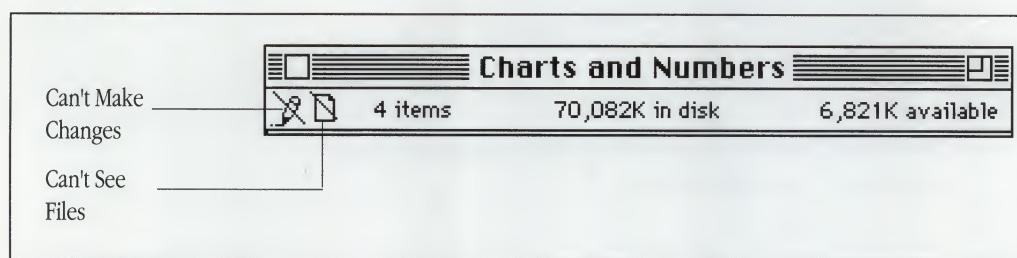
The current access privileges for a particular folder can be seen by using the Get Privileges command from the Finder File menu. This command also allows the owner of a folder to change the current access privileges.

Folder whose access
priveleges you're
viewing

Current location
(including volume,
server, and zone, if any)

Name of user
logged on

User's access privileges

Folder's owner, who can
set or change access
privileges

Group (if any) with access
privileges for the folder

```
┌──────────────────────────────────────────────────────────────┐
│ ☐                    Access Privileges                         │
│                                                                │
│   ┌──┐  New Products                                    v2.0   │
│   │  │        On volume:    Product Marketing                  │
│   └──┘     Logged in as:    John Rogue                         │
│         Your privileges are: See Folders, See Files, Make Changes │
│  ............................................................  │
│   ☐ Locked    Owner:    John Rogue                             │
│                                                                │
│               Group:    Product Research                       │
│                                                                │
│  ............................................................  │
│                                                                │
│   ┌──────────┐      ┌──────────┐       ┌──────────────┐       │
│   │   Undo   │      │   Save   │       │ View Another │       │
│   └──────────┘      └──────────┘       └──────────────┘       │
└──────────────────────────────────────────────────────────────┘
```

To log off, users simply drag the network volume into the trash can on the Macintosh desktop.

Compatibility

AppleShare client software for the Macintosh is 100 percent AFP compatible.

Summary

Apple's AFP client software for the Macintosh is the most elegant example of transparent file service integration in the computer industry today. It is easy to use and yet provides powerful security and administration features. It is now provided with the standard system software for every Macintosh, allowing users to choose AFP server vendors but retain the advantage of a single user interface. Along with the built-in networking interface, it makes file service capability a standard feature of every Macintosh.

This is an unprecedented commitment by a computer manufacturer to provide a standard user interface and software for network file service at no charge to users.

MS-DOS Client Software

Apple's AFP client software for MS-DOS computers is called AppleShare PC. AppleShare PC software offers two important advantages to users of PC-compatible computers: it provides access to information stored on an AppleShare file server; and it gives MS-DOS users access to the power of networked printers such as the Apple LaserWriter and ImageWriter.

With AppleShare PC, MS-DOS users on an AppleTalk network have the same ability as Macintosh users to access folders, documents, applications, storage space, and peripherals. And using the AppleShare server from a MS-DOS system is as easy as using a local disk drive.

AppleShare PC fully supports the AppleShare file server's powerful access privileges. File server users control information by granting access to the directories they have created on the file server volumes.

Through AppleShare PC, users of MS-DOS applications that support PostScript® (such as Microsoft Word and WordPerfect) can take full advantage of the power of the Apple LaserWriter printers. This includes producing documents in a wide range of type styles and sizes, and with full-page, high-resolution graphics. For users of older MS-DOS applications that do not support PostScript, AppleShare PC provides an emulation of an Epson LQ2500 printer.

Installation

The software requires a LocalTalk PC Card for the physical network connection. The installation procedure consists of installing AppleShare PC software on a startup disk, adding a LocalTalk PC Card to an IBM PC or compatible computer, and attaching the computer to an AppleTalk network equipped with an AppleShare server and a networked printer. AppleShare PC is easy to install, prompting the user with questions as necessary.

Log-on

Logging on to the AppleShare file server with AppleShare PC is through a PC "desk accessory", which can be activated via a pop-up or TSR (terminate and stay resident, such as "SideKick"). AppleShare PC can run as a stand alone application or be included as part of your AUTOEXEC.BAT file for use as a TSR. The DA features a Chooser-like interface that is very similar to the Macintosh equivalent.

Once the software is activated, the PC user has all of the features available to Macintosh clients in terms of file and print service. The PC user is then free to select zones, servers, and volumes. Log on is accomplished simply and in a manner familiar to the MS-DOS user.

Mounted AppleShare volumes are presented as typical PC volumes, beginning with the next available letter. AppleShare or other AFP server volumes are used like any other MS-DOS volume. Once connected, the AFP server acts like a locally connected PC hard disk.

Application Compatibility

Apple licenses the MS-DOS Redirector from Microsoft and includes it in AppleShare PC. The MS-DOS Redirector determines whether file or print requests are local or remote over the network and redirects remote requests to the appropriate network resources.

AppleShare PC supports DOS Share, the standard MS-DOS record and file-locking interface for multiuser applications software. Multiuser applications allow more than one user to have access to the same file at the same time and control access at the record level. Multiuser applications that are written for this DOS standard are compatible with AppleShare PC.

AppleShare PC improves the level of integration between Macintosh and MS-DOS by providing file extension mapping that allows MS-DOS users to easily assign a Macintosh icon type and application appropriate to a MS-DOS data file. This means that to the Macintosh user the MS-DOS data files appear as Macintosh icons. (TOPS does not provide this facility; it creates blank generic icons that must be opened from within the application.)

Support of the Microsoft MS-DOS standards ensures the compatibility of AppleShare PC with future versions of DOS. AppleShare PC does not support the NetBIOS interface, though this affects only certain applications and utilities for specific PC networks.

Summary

AppleShare PC provides an easy-to-use and effective file and print service solution for MS-DOS users. AppleShare PC is ideally suited to the requirements of the growing community of users who work in a mixed Macintosh/MS-DOS environment. Not only does it let MS-DOS users share and store applications and files in one convenient location, it also provides access to networked LaserWriter and ImageWriter printers directly from MS-DOS applications. (TOPS requires a separate utility, TOPS NetPrint, to enable MS-DOS PCs to print to LaserWriter printers on the network.)

AppleShare 2.0, Macintosh AFP client software, and AppleShare PC provide a well-integrated, powerful, and easy-to-use solution for file sharing between Macintosh and MS-DOS workstations at a low cost from a single vendor.

Novell Netware for Macintosh

At a glance...

Type of Server:	Dedicated
Hardware Platform:	80286 or 80386 PC compatible
Server Software:	Advanced NetWare v2.15, NetWare for Macintosh
Macintosh Client Software:	Apple AFP client software (from Apple) plus addition NetWare desk accessory
MS-DOS Client Software:	Drivers for over 80 different adapters
Concurrent Users:	100
AFP Compatibility:	Version 1.1—100%

NetWare for the Macintosh provides AFP 1.1 compatibility for Novell servers running Advanced NetWare version 2.15 on 80286 and 80386 machines. Novell is the first major MS-DOS network vendor to offer AFP compatibility. NetWare for the Macintosh opens the door for Macintosh computers to be easily integrated into the more than 220,000 NetWare systems installed. Existing Novell customers now have a simple and low-cost way to integrate Macintosh workstations into their existing networks.

NetWare for the Macintosh is available as an upgrade to existing Netware servers for (not copy protected, one copy to be purchased per site). LocalTalk connections to the NetWare server can be made by adding the Novell LocalTalk NL1000 adapter for the standard AT bus servers and the Novell LocalTalk NL/2 adapter for MicroChannel based servers. EtherTalk connections can be added by installing an EtherLink Plus board. NetWare for the Macintosh supports Macintosh, MS-DOS, and OS/2 workstations.

Product	Description	
Advanced NetWare v 2.15	Server and Administration Software	
LocalTalk NL1000	LocalTalk adapter card for Novell server	
Macintosh Client Software	Macintosh AFP Client Software	(included w/ Mac system software)
PC Network Card	PC XT/AT Ethernet Adapter Card	
PC Client Software	(Novell driver for net cards)	(included)

To add Macintosh support involves the following components:

- NetWare for Macintosh—(included free in future NetWare versions)

- LocalTalk NL1000 adapter card for Novell server— (LocalTalk NL/2 adapter supports Micro Channel)

- Macintosh AFP client software—N/C (included with Macintosh system software from Apple)

- LocalTalk Connector Kit — (for each Macintosh)

A major benefit to Macintosh users is that NetWare for the Macintosh was developed in full compliance with Apple's AppleTalk Filing Protocol (AFP) and Printer Access Protocol (PAP). This enables the Macintosh workstation to use the standard AppleShare client software to access the NetWare file server and ensures compatibility with future versions of the AppleTalk network and AppleShare.

By being AppleShare compatible, NetWare provides support of AppleShare security and privacy controls, in addition to providing NetWare enhanced security, system fault tolerance, and resource accounting functions.

NetWare allows both IBM PCs and Macintosh workstations to share data transparently. The Macintosh user sees files stored on the network as familiar icons. To other workstations on the network (PCs running DOS, OS/2 or Windows/386), files are listed in the format of the workstation operating system. Users can open files from the server as easily as they open files from their local drives.

NetWare supports the sharing of networked printers such as the Apple LaserWriter, as well as print spooling and print queuing capabilities from both the Macintosh and PC side.

The first release of the product supports both LocalTalk and EtherTalk Macintosh cabling schemes. Interconnectivity to multiple topologies such as Token Ring, ARCNET, and other adapters is also possible.

How NetWare compares to AppleShare

NetWare is AFP compatible and offers all the benefits of other AFP-compatible file servers such as AppleShare, including the ability to share files with MS-DOS workstations. Below are areas of difference between the two products:

- **Security.** NetWare offers additional access privileges to the Macintosh. Novell wanted to support the Macintosh as a peer to MS-DOS and, therefore, provided the same access privileges. It is up to the Macintosh user to determine whether the additional access controls offer significant advantages for users over AppleShare access controls.

NetWare's additional security features three levels of user access:
Users can be required to periodically change their passwords, to use passwords they have not used in the past, and to use passwords that are longer than a minimum length.
— Users can be given a predetermined number of tries at logging in before the system locks them out.
— Access can be limited to designated directories, to a specified Macintosh workstation or to specific hours of the day.

- **Administration capabilities.** NetWare for Macintosh includes an application, similiar to the AppleShare Admin program, that allows network administators to set access rights, monitor the server, and perform other functions from the Macintosh. Full administration for NetWare for Macintosh version 2.15 can only be run from a MS-DOS station and is considered to be complex. Administration and installation of a Novell server requires an experienced, proficient network administrator. On the other hand, AppleShare is both easy to install and administer.

- **Data Integrity.** Advanced SFT NetWare includes "System Fault Tolerant" features, which are valuable for applications that require a high level of data integrity and the ability to reconstruct changes to files. Novell offers two basic ways to accomplish this:
  - Disk Mirroring. Basically, a redundant disk drive is attached to the server. All files are stored on two disk drives, so that if one fails, the latest information remains available.
  - Transaction Tracking System (TTS). TTS secures shared data resources against loss or corruption due to incompleted transactions. TTS guarantees that all write operations within a given transaction will either be written to a disk entirely, or none will be written. This ensures database integrity in the event that either the workstation, the network server, or the connecting communications media fails before completion of a transaction.

- **Workstation support.** NetWare provides a platform for integration of Macintosh, MS-DOS and OS/2 workstations. It supports up to 100 users. AppleShare supports Macintosh, MS-DOS and Apple II workstations for up to 50 users.

- **CD-ROM support.** AppleShare supports CD-ROM drives. NetWare does not.

Strengths and Weaknesses
Recommendations
Novell NetWare is one of the most sophisticated solutions for PC-based networks. It supports a wide variety of physical networks and server configurations and is a mature product, offering advanced features.

However, there is a price to be paid for supporting so many types of hardware configurations and features: complexity. Compared to an AppleShare server, NetWare for the Macintosh is difficult to install and administer. The setup process is also highly complex, as is administration. There are many option and configuration questions to answer. There are a lot of terms to learn and a virtual library of documentation to navigate.

Novell servers are time-consuming to configure and to obtain the advanced features offered, the process usually requires an experienced dealer.

In general, NetWare for Macintosh should be recommended in the following situations:

- **Existing NetWare customers.** NetWare for Macintosh allows inexpensive integration of Macintosh workstations into their existing network environment.

- **Improved security needs.** The additional features of NetWare provide increased security for some applications.

- **High data integrity requirements.** The disk mirroring, transaction logging, and other fault-tolerant features of NetWare make it appropriate for applications for which the loss of any data since the last backup cannot be tolerated.

- **OS/2 support.** Novell offers the best solution currently available for integration of OS/2 and Macintosh file service.

TOPS

A sun Microsystems Co.
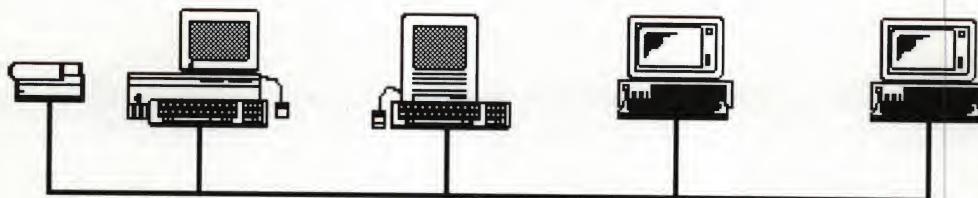
At a glance...

Type of Server:	Nondedicated, background
Hardware Platform:	Macintosh, PC compatible
Server Software:	N/A
Macintosh Client Software:	TOPS for Macintosh
MS-DOS Client Software:	TOPS for DOS— (requires LocalTalk card)
Concurrent Users:	10
AFP Compatibility:	None (multiuser features of HFS only)

TOPS (Transcendental Operating System) is a background file server for Macintosh computers and MS-DOS compatibles. It is best used for small networks of 2 to 4 people who don't intend to add additional members and who need to transfer files infrequently. TOPS for the Macintosh consists of a software installation disk. TOPS for the MS-DOS computer consists of an interface card and a software installation disk.

Product Summary

Product	Description
TOPS for the Macintosh	(software)
TOPS for DOS	(software)
TOPS FlashCard	LocalTalk card for PCs
NetPrint	MS-DOS network print utility
TOPS Repeater	LocalTalk repeater (hardware)
Teleconnector	Phone-type LocalTalk connector

TOPS is primarily intended to allow Macintosh and MS-DOS workstations to transfer files. The TOPS product also includes DataViz's MacLink software, which allows conversion of file formats between Macintosh computers and PCs for use in popular applications.

TOPS is a background server implementation. TOPS software runs in the background of a Macintosh or a PC with a LocalTalk card (Apple or TOPS) to provide file service to other workstations on the network. Through a desk accessory, TOPS users can "publish" individual volumes or folders attached to their computers for access by other workstations on the network. These workstations become "clients" of the

server station. Each TOPS user can simultaneously act as a "server" and a "client." In its product manuals, TOPS refers to this as a "distributed file service." In truth, it is a background server that allows information to be distributed. *See background vs. dedicated server discussion on page 9 through 14.*

Server Installation
Macintosh Installation
Installing TOPS software on the Macintosh involves these three steps:
1. Copy all the TOPS files from the TOPS Disk 1 into your System Folder. You can also use the TOPS Installer utility included with the product, which handles the moving and installation of all the TOPS files required for installation.
2. Use the Font/DA Mover to copy the TOPS desk accessory into your System file.
3. Restart your Macintosh.

PC Installation
Because IBM PCs and compatibles do not have built-in networking interfaces, an interface card must be installed. TOPS provides a networking interface for the PC called FlashCard. The TOPS FlashCard PC interface card provides an optional LocalTalk mode called FlashTalk, which claims to be three times as fast as AppleTalk.

Installing TOPS software on a PC is slightly more complicated; it requires nine steps on a hard disk or 15 on a floppy disk. However, an "Installer utility" does most of the work, asking user input only for such options as startup drives.

Log On
Operation of Macintosh and PC TOPS is similar and involves a few basic concepts.

Every TOPS-equipped computer can be both a client (workstation) and a server.

As a client, users may use local volumes or remote volumes that are attached to other TOPS stations. Additional client activities include listing available servers and their volumes, and copying files from servers to clients.

When a user makes his or her workstation's volumes or folders on a volume available to other TOPS users it is called "publishing." The users workstation then becomes a server to the rest of the network. Additional server activities include listing clients and "unpublishing" volumes or folders.

Macintosh users access TOPS through a desk accessory that brings up this window:
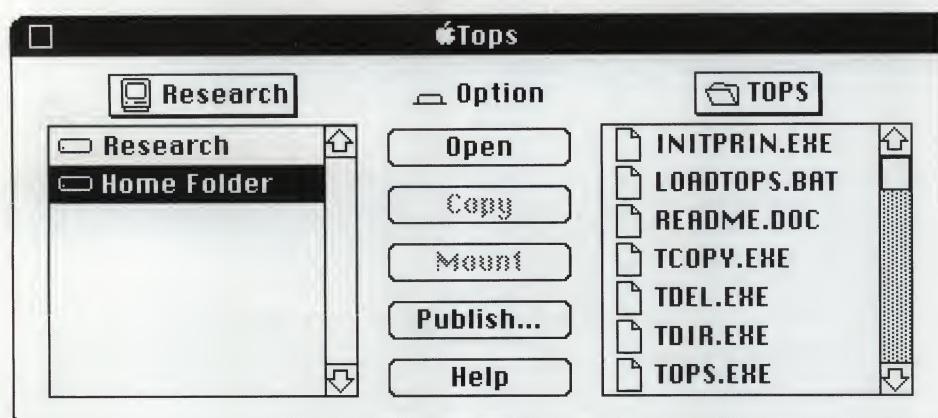
A volume or folder may be "auto published" whenever a computer is powered up or "manually published." Up to 10 clients (other TOPS workstations) may concurrently access the published volume(s) on a TOPS server.

PC users must run a program called "LOADTOPS" on powering up to install two memory- resident TOPS programs. Operation on the PC is through an additional stand-alone program called "TOPSMENU."

Security

TOPS security is limited to a single password for each published volume or folder. This means that if you want only one or two individuals to access a file, you must move the file to a special folder and assign a password. If you want someone else to access a single file but nothing else in the folder, it can't be done. While this is adequate for small, simple applications, it is realistically unworkable for serious applications and large volumes with many files to share.

When volumes or folders are published, each may have a password specified for client access. This means that a user has to remember multiple passwords in order to obtain information located in different folders or different volumes. This kind of security can be very cumbersome, causing users to simplify the system by either writing down the numerous passwords or not assigning them at all — entirely defeating the purpose. Access privilege options are limited to publishing files on a read-only or a read-write basis. This Read/Write control is set by the "publisher."

To change any access privileges to a TOPS volume, the owner must remount the volume. With Apple-Share, it is as simple as selecting the folder and pulling down the Access Privileges menu at any time.

The TOPS security system is very limited. Because it does not maintain a registered user list at each station, any user with the password can access any information in the published volume or folder. Any other approach would be very difficult in a multiple, nondedicated server setup without a network administrator with maintenance responsibility.

Compatibility

TOPS supports the Macintosh 512K and all subsequent models. On the MS-DOS side, it supports IBM PCs, PC/XTs, and PC/ATs with a LocalTalk card (from TOPS or Apple) and DOS 3.1 or later.

TOPS FlashCard is not compatible with Apple's AppleShare PC client software. However, Apple's LocalTalk PC Card will run both TOPS and AppleShare PC software.

TOPS software for the PC is compatible with software applications that are written to the MS-DOS Redirector level. The MS-DOS Redirector determines whether file or print requests are local or remote over the network and redirects remote requests to the appropriate network resources.

Most popular applications will run with TOPS, but care must be taken when it is used with memory-resident software and unusual storage-device configurations. Certain memory-resident programs must be loaded before TOPS, while others must be loaded after it.

Most importantly, TOPS is not AFP compatible. It does use a protocol that has some features of AFP and the Macintosh version does support the multi-user features of the HFS file system, but it is not AFP compatible at the user interface level or network protocol interface level.

TOPS is simple to use, but it also offers only simple functions and limited performance, especially for users of a server station that is being heavily accessed.

## How does TOPS compare with AppleShare?

TOPS claims in its literature that its "distributed file service" offers performance superior to that of dedicated servers such as AppleShare in the areas of economy, reliability, and performance.

Economy

When used in a background server environment, TOPS is less expensive for very small networks of 2 to 4 computers who do not intend to grow.   However, each TOPS-connected Macintosh requires the $249 software product. In contrast, AppleShare client software is included free with each AppleShare server product, as well as included in the Macintosh system software.

Often not included in comparisons of background servers and dedicated servers is the cost of hard disks. Even in small configurations, a TOPS server station must have a hard disk of sufficient size to effectively handle the storage needs of the client workstations. Even if only one TOPS workstation has a hard disk, at somewhere between 5 and 10 nodes, the cost of AppleShare and TOPS networks becomes comparable.

The following chart compares the cost of TOPS and AppleShare file service for 5, 10, 25, and 50 Macintosh workstations on a LocalTalk network with one shared hard disk of 20, 40, or 80 megabytes.

Background vs Dedicated File Servers

	5 Mac WS / 20MB	10 Mac WS / 20MB	25 Mac WS / 40MB	50 Mac WS / 80MB
AppleShare	$4,047	$4,422	$7,947	$13,118
TOPS	$2,619	$4,239	$9,699	$18,299

■ AppleShare

Dedicated server configurations include:
1. CPU bundle
2. Hard disk
3. AppleShare 2.0
4. LocalTalk Connector Kits

- 5 User/20MB = Macintosh Plus, External HD20SC
- 10 User/20MB = Macintos Plus, External HD20SC
- 25 User/40MB = Macintos SE 40/2, Internal 40MB
- 50 User/80MB = Macintos II, Internal HD80SC

Workstations include LocalTalk Connector Kits only.

▨ TOPS

Background server configurations include:
1. TOPS software for each Macintosh
2. LocalTalk Connector Kits
3. One (1) external HD20SC, HD40SC, or HD80SC

Note: TOPS can only support 10 concurrent users per server station.

(See Apple Price List Appendix for more details)

*Product prices were taken from published vendor price lists. All prices used are suggested retail.*

TOPS can also be used as a dedicated server, except that it can support only 10 concurrent users. In this configuration, the hardware costs are identical for AppleShare and TOPS. Since TOPS software sells for $249 for both the server and each workstation, and AppleShare sells for $799 with no per-workstation additional charge, AppleShare is less expensive for three or more workstations.

The following chart compares total network costs (excluding workstations and cabling) for TOPS and AppleShare dedicated servers in three configurations, including hardware and software for 10, 25, and 50 Macintosh workstations.
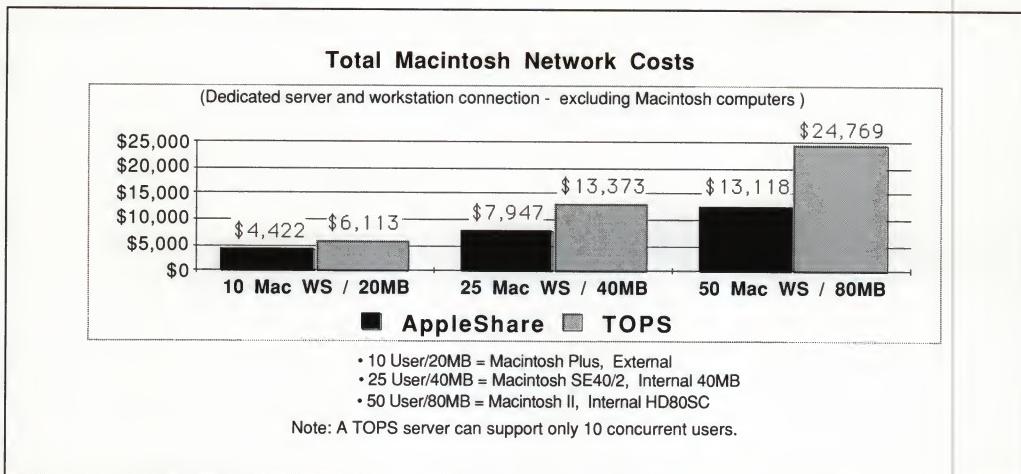
Total Macintosh Network Costs

(Dedicated server and workstation connection - excluding Macintosh computers)

	AppleShare	TOPS
10 Mac WS / 20MB	$4,422	$6,113
25 Mac WS / 40MB	$7,947	$13,373
50 Mac WS / 80MB	$13,118	$24,769

- 10 User/20MB = Macintosh Plus, External
- 25 User/40MB = Macintosh SE40/2, Internal 40MB
- 50 User/80MB = Macintosh II, Internal HD80SC

Note: A TOPS server can support only 10 concurrent users.

Product prices were taken from published vendor price lists. All prices used are suggested retail.

Also, it costs less to connect additional Macintosh workstations to an AppleShare server. For $75—the cost of a LocalTalk Connector Kit alone—a Macintosh can take advantage of an AppleShare server. In contrast, each TOPS Macintosh workstation requires a LocalTalk Connector Kit and TOPS software at $249, for a total of $324 per Macintosh.
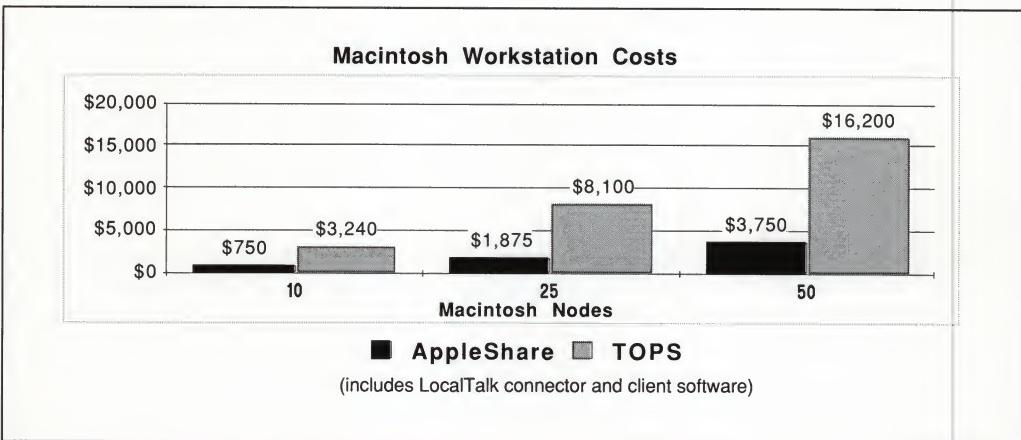
Macintosh Workstation Costs

Macintosh Nodes	AppleShare	TOPS
10	$750	$3,240
25	$1,875	$8,100
50	$3,750	$16,200

(includes LocalTalk connector and client software)

Product prices were taken from published vendor price lists. All prices used are suggested retail.

The cost of connecting MS-DOS workstations is similar for TOPS and AppleShare, though the Apple solution is slightly less expensive. Each requires a LocalTalk Connector Kit, LocalTalk PC interface card, and client software. The Apple solution is $473 per PC, compared with $503 for TOPS.
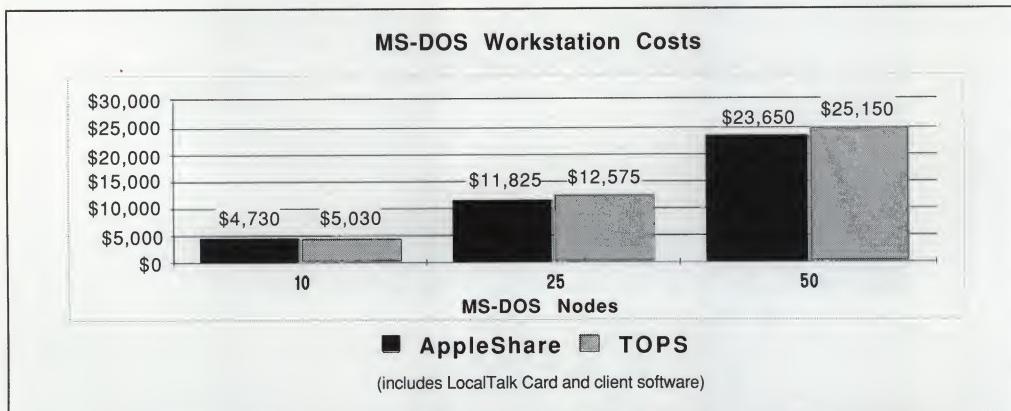
MS-DOS Workstation Costs

$4,730	$5,030	
$11,825	$12,575	
$23,650	$25,150	

AppleShare ■ TOPS

(includes LocalTalk Card and client software)

MS-DOS Nodes: 10, 25, 50

Product prices were taken from published vendor price lists. All prices used are suggested retail.

Reliability

TOPS argues that a background server network is more reliable, because there is no single point of failure as in a central, dedicated server. In other words, if there is only one file server, and it has a hardware failure, then no workstations have file service. However, this is a risk in any server unless there is completely redundant hardware and software. For example, when a TOPS server crashes, unless the information on each server is kept identical, the effect is the same for users of that information.

Because the same hardware is used, the risk of hardware failure is the same for a single TOPS server as an AppleShare server. However, background servers are inherently more prone to loss of data, because they also run applications software and interact more with users; if a workstation crashes, clients of that workstation will lose data. With a dedicated server, workstation crashes cannot cause server data loss.

Performance

TOPS claims better performance by distributing file service, but a neglected consideration is the performance of the host workstation providing the file service. A benchmark test reported in the June 1988 issue of Macazine showed that a single TOPS client degraded the performance of a Macintosh TOPS server by 38 percent. A second client slowed it to 50 percent of its original performance. TOPS also experiences performance degradation when using it through a bridge or gateway.

There are other important issues that must be considered when comparing TOPS and AppleShare:

- AFP compatibility
- Security/Privacy
- Administration

AFP Compatibility

TOPS is not AFP compatible. It does use a protocol that has some features of AFP and the Macintosh version does support the multiuser features (extended open and byte-range locking) of the HFS file system, but it is not AFP compatible at the user-interface level or network-protocol interface level. This means that AFP access privileges and login through the Chooser are not supported. Additionally, TOPS

will not work correctly with AFP-compatible servers or client implementations, or with next-generation network software that is written specifically for AFP server environments.

Netware for the Macintosh, PacerShare, and AlisaShare are AFP compatible. TOPS is not.

Security/Privacy

TOPS security is limited to a single password for each published volume or folder. This means that if you want only one or two individuals to access a file, you must move the file to a special folder and assign a password. If you want someone else to access a single file but nothing else in the folder, it can't be done. While this is adequate for small, simple applications, it is realistically unworkable for serious applications and large volumes with many files to share.

AppleShare extends the concept of security by allowing access to be controlled on a per-user basis, down to each folder within a volume. This allows volumes, files, and folders to be organized logically, and access controlled by either the "owner" of the information or a system administrator. There is also only one password for the user, which can be changed by the user. One password provides access to all the information available to that user (as opposed to needing to remember multiple passwords for multiple volumes).

The registered user list of AppleShare ensures that a user has a specific set of access privileges associated with their log-in name and password. This allows the individual personal control over information placed on the server. The owner decides whether everyone, no one or only a specified group of people has access to his or her information.

AppleShare offers the advantages of a centralized server in the areas of physical security and backup discussed earlier, making it more appropriate for mainstream business applications.

Administration

TOPS marketing materials give the impression that an advantage of TOPS is the elimination of network administration. But every network using file service requires some level of network administration. In some ways, TOPS is simple to administer, because security and other features are limited. And TOPS is a simpler and less powerful product. However, backup, troubleshooting, data concurrency, and version maintenance are made more complicated by the multiple background server approach. See page XX for a further discussion of administration issues.

Conclusion

Strengths

TOPS is a good entry-level networking product for small (two to four nodes with no plans for growth), networks that need only occasional access to or transfer of files. It is simple to install and operate and has adequate security for simple applications.

Weaknesses

- **Cost**. TOPS is cost-effective for five to ten workstations as a background server and for one to three workstations in a dedicated server configuration. Beyond that, the cost of workstation software offsets the money saved by not having a dedicated server.

Another consideration is the replacement of the TOPS software — and, in some cases, hardware — if TOPS was being run in a dedicated configuration with a MS-DOS PC, if the network is upgraded to AFP.

- **Reliability.** Background servers are inherently more prone to loss of data, since they also run applications software and are exposed to everyday interaction with users. The TOPS background approach is not well suited for serious database use or important document storage. Because TOPS places data at individual workstations, if a workstation/server with active clients crashes, data can be lost. Similiarly, if a user is not there you can not get access to the data residing on his or her workstation.

In contrast, AppleShare servers are dedicated, and client workstations cannot cause server data loss. Among other advantages, centralized servers also allow for physical data security, controlled backup procedures, simplified system updates, and the ability to organize information so that it is readily available and easy to find and access.

- **Performance.** TOPS is designed to support occasional file transfer and conversion for a maximum of 10 clients within the memory and performance restrictions of background processing. Background servers cannot use the full resources of the host computer for caching and other performance-enhancing features to provide optimum service for client workstations. AppleShare takes advantage of the full resources of the server computer, allocating all available memory for caching, large buffers, and support of up to 50 workstations. Processing power is left over for concurrent tasks such as electronic mail and print spooling.

Running a background server also seriously degrades the performance of the workstation hosting it. Anything but occasional file service imposes an impractical performance penalty on a TOPS server station. With AppleShare or other dedicated servers, another user's file service activities do not affect a client workstation's normal operation.

- **Security.** The simple single password per volume/folder approach used by TOPS is not adequate for serious file sharing and applications where security of information is important.

- **AFP Compatibility.** TOPS is not AFP compatible, which affects the user in terms of a standard user interface for log-on and access privileges, product compatibility (AFP applications and servers) and AppleTalk Network System compatibility.

Recommendations

TOPS should be positioned as an entry-level product for very small (two to four nodes with no plans for growth) networks with an emphasis on file transfer and conversion rather than file service.
The company has chosen not to adopt AFP which affects current and future compatibility with next-generation network applications and AFP servers. The product falls short on security, performance, data integrity, and cost-effectiveness for mainstream business file service applications. This will become even more important as traditional business applications such as accounting and databases migrate from multiuser systems to Macintosh- and PC-based local area networks.

3Com 3+Share for Macintosh
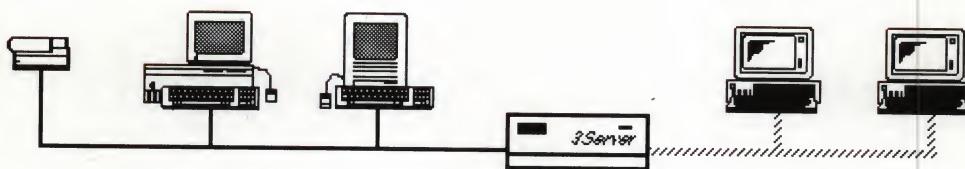
At a glance...

Type of Server:	Dedicated
Hardware Platform:	3Server model 32S400—80186-based
Server Software:	3+Share—1.3.1, 3+Mac
Macintosh Client Software:	3+Share for Macintosh
MS-DOS Client Software:	Any NetBIOS compatible
Concurrent Users:	N/A
AFP Compatibility:	None

3Com's Macintosh and MS-DOS server product consists of an 80186-based dedicated hardware server called 3Server model s400, running 3+Share software version 1.3.1 and 3+Mac for Macintosh clients. The s400 has both Ethernet and LocalTalk interfaces built in. Macintosh computers are connected via standard LocalTalk or EtherTalk, while PCs use Ethernet adapter cards that are NetBIOS compatible.

Product	Description
3+Share v 1.3.1	Server and Administration Software (included with server)
3+Share Macintosh	Macintosh AFP Client Software (multiple Macs)
3Server Model s400	Dedicated Server (60mb disk, 1mb mem)
Ethernet PC Card	PC XT/AT Compatible Adapter Card
MS-DOS Client Software	(Included with adapter)

Product Overview

Before AppleShare and AppleShare PC , 3Server was the only solution available from a major vendor for integrating Macintosh and MS-DOS computers. Until recently, 3Com has resisted the move toward AFP as the standard for integrating Macintosh, PCs and other computers. It has relied on its existing Ethernet and PC-oriented protocol implementations and "patched in" the Macintosh. This leads to user confusion, as shown by the illustration of a typical Macintosh Chooser display below. Note that AFP-compatible AppleShare and Novell Netware servers show up as AppleShare servers; 3+File (3Server) must be accessed separately.
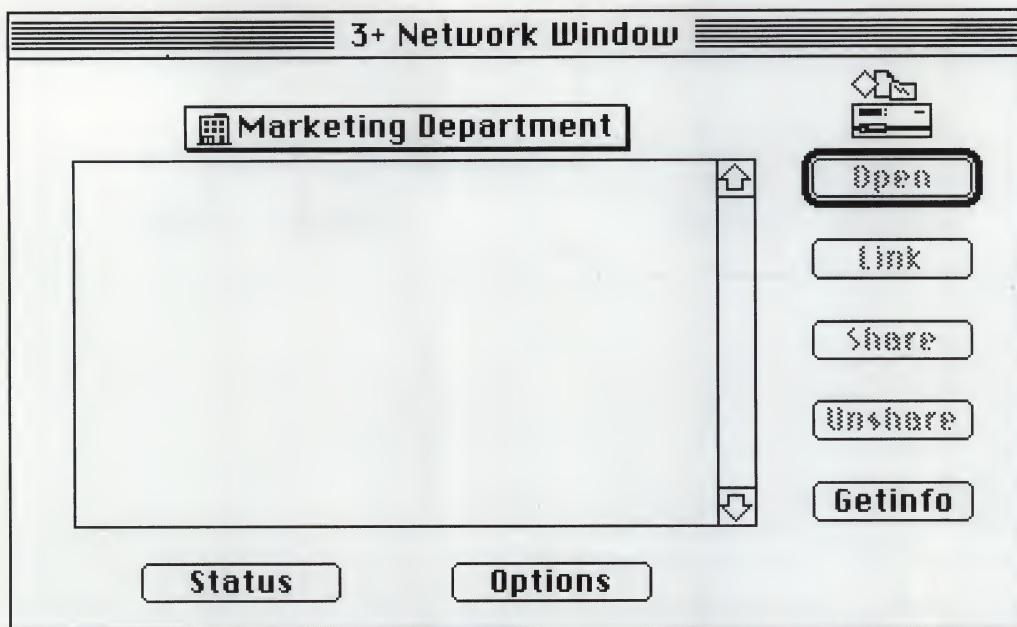
Interaction with 3Server is through the "Network Window" shown in the next illustration, which uses a different user interface than AppleShare, including confusing elements of Ethernet-oriented architecture.
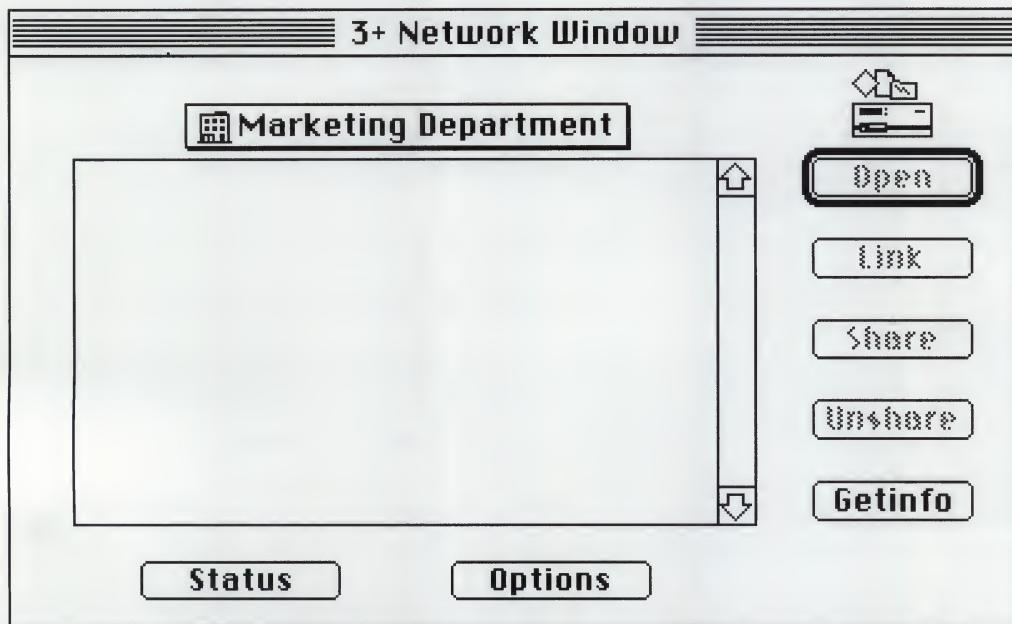
Instead of standard Chooser selection, network "objects" are selected, then "linked" to the user. There are many other windows with confusing options and "hardwired" numbers that must be set for proper network operation.

There is a four-level hierarchy—Network, Organization, Domain, and User—of network organization, which creates confusion with standard AppleTalk zones.

AFP access privileges are not maintained. Access follows the PC model, including drive letter designations. Folders are "Private" or "Sharable."

In general, the user sees different terminology, interface, and organization of the network, rather than the transparent integration of Apple's AFP Client software with the Finder.

Recommendations

Support for the Macintosh is only available through the 3Server (s400) product, which requires a PC with an Ethernet card. This makes it a poor and costly choice for networks that consist totally or primarily of Macintosh systems.

With the announcement by Novell of full support for the AFP standard, 3Com has moved up its plans for AFP compatibility in its 3+Open product to stay competitive. Until that time, however, 3Com should only be recommended for current 3Com customers who want to integrate Macintosh computers into their existing system.

In August, 1988, 3Com announced its support of AFP. Its product is expected to be released in 1989. At that time, an update of this section of the report will follow.

Chapter 4   **Glossary**

Macintosh/MSDOS Server Glossary of Key Terms

3+ Network Hierarchy

3Com network products use a 4 level hierarchy: Network, Organization, Domain, Name. A Domain is roughly the same as an AppleTalk zone. An Organization is similar to an AppleTalk internet (group of networks connected by bridges) in a single location. Multiple internets or Organizations connected together form the Network.

3+ Share for Macintosh

3Com's software product that connects Macintosh workstations to the 3+ network.

3+Share

File server software from 3Com which runs on 3Server file server hardware products.

3+Share for Macintosh

Software for the Macintosh for use on 3+Share networks from 3Com.

3Server

A dedicated hardware file server from 3Com. There are several 3Server models.

A

Access Privileges

Generally, the controls that an administrator or network user can apply to control access to information on a file server. These generally include read only, read/write, rename, etc. This is an AppleShare term for the privileges, given to or withheld from users, to open and make changes to folders and their contents. Through the settings of access privileges, you can control access to the information that's stored on a server.

Access Privileges Desk Accessory

A Macintosh Desk Accessory that allows AppleShare workstation users to examine access privileges of folders and change privileges for folders they own. See also *Get Privileges*.

access rights

3Com term for attributes you assign to a Shared Folder Name to control how users access and use the folder with that Shared Folder Name.

Admin key

Administrator password. AppleShare term for a unique word or set of characters (password) that you must enter before you can open the AppleShare Admin program. The first time you open AppleShare Admin to install AppleShare File Server software, you decide on the Admin key.

Administrator

Also *network administrator or file server administrator*. Generally, the person who is in charge of maintaining a file server including assigning passwords, storage management, version control, troubleshooting, etc. An AppleShare term for the person who sets up a server, registers users and their passwords, creates groups, and maintains a server. The administrator is the "user" who becomes the owner of the prepared server volumes and any folders already on them. The administrator chooses a name and password and can use them to log on from a workstation just as a registered user does.

Advanced NetWare

A Novell software product. A version of NetWare. See also *NetWare*.

AFP

Apple term for *AppleTalk Filing Protocol*. The protocol standard for AppleTalk Network System file service. See also *AFP Compatible, file server, Access Privileges*.

AFP Compatible

An AFP compatible server supports all the required protocol features of AFP version 1.1 or 2.0. It will show up in the Chooser as an AppleShare server would and will function properly with standard Macintosh client software from Apple, the Apple IIe Workstation Card (2.0), Apple IIGS (2.0), AppleShare PC, or other AFP compatible workstation. AFP compatible workstations support all the features of the AFP protocol standard and will work properly with any AFP compatible server.

Alias

A TOPS term for assigning a longer (16 character) name when publishing a PC volume or printer.

alias

3Com term for a second name given to a network object.

AppleShare

A software product from Apple that converts a Macintosh computer into an AFP 2.0 compatible file server.

AppleTalk Network System

The connectors cables, and cable extenders; the network software built into the Macintosh and Apple IIGS; and the other computers and network devices, such as printers, bridges, and file servers, linked together in a communications network. This can also refer to the protocols and other standards related to AppleTalk. See also *network*.

application

Short for application program. A program that performs a specific task, such as word processing, database management, or graphics.

Auto-publishing

A TOPS term for setting up TOPS on a station to automatically publish certain volumes when a station is powered up.

B

background server

Usually software which runs in the background of a workstation to provide limited file service to other workstations. Also called a non-dedicated server.

bridge

A combination of hardware and software that connects two or more networks in an internet. Bridges are used to increase the number of devices and the distances covered in a network. See also *internet*.

C

cable

An insulated bundle of wires with a connector at each end. Examples are the LocalTalk and Ethernet cables.

Chooser

A Macintosh desk accessory that is included with Apple System software. You use the Chooser to choose network services. Specifically with AppleShare the Chooser is used to to log on to a server and access server volumes.

client

File service involves two sides: a server and a client. A client is a workstation which is logged on to a file server.

Client (TOPS)

A TOPS term for any station using a volume published by a server station.

See also file server, client.

concurrent application

An application that runs on the server's Macintosh at the same time as the AppleShare File Server application and provides service to users on the network.

concurrent users

Workstations which are logged on to a file server at the same time.

D

dedicated server

A combination of hardware and software whose primary purpose if to provide file service.

Distributed File Service

TOPS term for TOPS stations that provide background file service to other stations. Distributed, when applied to computing, means that a single logical entity is physically distributed over multiple locations. See also *file server, background server, dedicated server.*

Domain

3Com term for a part of an organization; usually named for a geographic location or a department. The domain is the middle part of the unique three-part name that uniquely identifies any object on the 3+network; Name:Domain:Organization.

E

EtherTalk

Hardware and software that you install on a Macintosh to connect it to Ethernet cables. For example, you can install the EtherTalk Interface Card and EtherTalk network software on the Macintosh II. Ethernet is a Xerox registered protocol type. EtherTalk is basically AppleTalk Network System protocols which are using Ethernet as a physical transport medium. EtherTalk provides much higher performance for file service. It also provides the physical connection to talk to other computers with Ethernet connections using AppleTalk or other protocols such as VAX or UNIX systems.

Everyone

The AppleShare user category to which you can assign privileges for any user with access to a server, whether logged on as a registered user or as a guest.

F

File server

A combination of software, one or more hard disks, and a computer or dedicated hardware that allows users to store and share documents, folders, and applications over a network.

file server administrator

See *administrator.*

FlashCard

A TOPS product. A LocalTalk interface card for IBM PC's and compatibles. See also *FlashTalk*.

FlashTalk

A TOPS communications standard that claims to be a 3x speedup of AppleTalk (LocalTalk). The FlashCard supports this speed.

Folder

Subdirectory equivalent in Macintosh. On a TOPS station subdirectories within a PC or an HFS Macintosh volume are represented in the Macintosh version of TOPS by a folder icon.

G

Get Privileges

A Macintosh/AFP server function similar to the Access Privileges Desk Accessory but accessed from the Finder File Menu. See also *Access Privileges Desk Accessory*.

Group

The AppleShare user category to which you can assign access privileges for the members of the groups you create. You can create groups of registered users only.

guest

An AppleShare user who is logged on to a server without a registered user name and password. A guest cannot own folders.

H

hierarchical file system (HFS)

The Macintosh feature that lets you use folders to organize documents, applications, and other folders on a disk. Folders (analogous to subdirectories in ProDOS and MS-DOS) can be nested in other folders to create as many levels in a hierarchy as you need. AppleShare lets you set access privileges for those folders and lock them.

Home Folder

A special folder on the 3+ network reserved for a users personal use.

I

installation

The process of installing server or workstation software and hardware. In AppleShare, the process of adding information to a hard disk to prepare it as a server volume. You use the AppleShare Admin program to install server software on the hard disks attached to the Macintosh.

Installer

The standard Macintosh software installation utility. Software which needs to be installed on a Macintosh includes a "script" file which the installer executes to copy files to the System Folder, System File, or other location and perform other necessary tasks. This provides a simple way with a standard user interface for all software installations which include installer scripts.

internet

Two or more networks interconnected by bridges to form a larger network. A specific AppleTalk term referring to and entire group of interconnected AppleTalk networks.

Inter•Poll

A network administration software application from Apple.

L

Link

The process of making a 3Com *network object* accessible from a workstation from within the Network Window. A logical connection.

Local

Local is a TOPS term, an adjective used to describe any resource that is attached to a station (your computer), such as a "local printer" or "local hard disk". See also *remote*.

LocalTalk cable system

A system of cables, cable extenders, and connector boxes that connect computers and network devices as part of the AppleTalk Network System.

LocalTalk connector box

A piece of equipment, consisting of a small box, a short cable, and an 8-pin, 9-pin, or 25-pin plug, that allows you to connect a device to an AppleTalk network system.

lock

To prevent a file from being edited, renamed, or discarded; to prevent a folder from being renamed, discarded, or moved elsewhere on a volume; or to prevent a disk or volume from being altered.

log off

To disconnect a workstation from a server. From a Macintosh workstation you usually log off by dragging any server volume icons to the Trash.

log on

The process of a user identifying himself to a server to establish a "session" for file service. This involves selecting a server from a workstation (Chooser) and identifying yourself (password). You can then select one or more server volumes and use them.

M

Make Changes

The AppleShare access privilege that gives the right to make changes to a folder's contents.

member

3Com term for one of a collection of users or objects in a group; typically a user in a group used as a distribution list for 3+ Mail.

mixed network

A 3Com 3+ network with both Macintosh and Pc netstations attached to servers.

Mount

A TOPS term for a station instructing TOPS to make a software attachment of a published volume to that station. This is called "mounting the volume". Once it has been mounted, the volume acts as if it were a disk drive on the client's computer. See *volume (TOPS), publish*.

multi-user application

An application stored on a server that more that one user can open and use to access the same file at the same time, such as a database program.

multilaunch application

An application stored on a server that several users can open and use at the same time.

N

Name Binding

The AppleTalk Network System protocol which provides logical names for servers, printers, users and other network entities. Each device connected to the network maintains its name and "registers" it on the network for others to find. There are 3 parts to an AppleTalk Name Binding name: the type, the name, and the zone. The type refers to the device or other type such as "LaserWriter, the name refers to a specific entity of the type such as "Advertising Department LaserWriter", and the zone is an AppleTalk zone in which the device resides such as"Cupertino Office". Macintosh users enter their "name" in the chooser. The *Namer* utility is used to give names to printers such as the LaserWriter or AppleTalk ImageWriter. Inter•Poll software shows the names on an AppleTalk network entities. See also *name service*.

Name service

A 3Com term for a data base that stores the names of and information about users, named network items, and named parts of the networks. Used by the Mail, File, and Print services. There is only one Name service per local 3+ network. In the AppleTalk Network System, the Name Binding protocol accomplishes this service. Each named device supplies its name to other devices and users on the network without a central device or data base to administer. See also *Name Binding*.

netstation

3Com term for workstation.

NetWare

A software product from Novell which converts an 80286 or 80386 based PC compatible into a file server.

NetWare for Macintosh

A Novell product which adds support for AFP 1.1 to a Novell file server using Advanced NetWare version 2.15 or higher.

network

A collection of interconnected, individually controlled computers and peripheral devices, together with the hardware and software to connect them. See also *AppleTalk network system*.

network address

A 3Com term for the twelve digit hexadecimal number that uniquely identifies a workstation or server on an Ethernet network. These addresses are sometimes set at the factory for interface cards and other devices. AppleTalk networks use dynamic network addresses that do not need to be set by the user.

network administrator

See *Administrator*.

network connection

Hardware and/or software which connects a computer or other device to a network. A combination of hardware (built in or interface card) and software (in rom or on disk) that lets you set up a particular implementation of the AppleTalk network system, such as LocalTalk or EtherTalk.

network object

A 3Com term for printers, servers, and shared folders which can be accessed across a network. Something you can make a logical connection (link) to and use on the 3+ network.

Network Window

The 3Com utility which workstations use to access Network Objects. See also *Network Objects*.

non-dedicated server

See *background server*.

O

Object

See *network object*.

operating system

The software that controls the basic operations of the computer and its peripheral devices. Examples are Macintosh OS, MS-DOS, ProDOS, UNIX, and VMS.

Organization

The top level of the 3Com name service hierarchy; often named for the company where the network resides. The Organization is the third part of the three-part name (Name:Domain:Organization) that uniquely identifies a network object.

Owner

The AppleShare user category to which you can assign access privileges for the owner of a folder or volume.

owner

The AppleShare registered file server user who created a folder or was assigned ownership of a folder or volume.

P

password

A unique word or set of characters that must be entered before a network user at a workstation can access a volume on a server, or other network entity.

primary group

The AppleShare *group* you specify in a user information window as the group with whom the user will most often be sharing documents stored on the server. When a user creates a folder, the primary group is automatically named as the group that will receive any access privileges set for the Group category. Se also *group; Group*.

print server

A combination of hardware and software that stores documents sent to it over a network and manages the printing of those documents on a printer.

privacy

Generally an AppleShare or AFP server term which refers to the features of a file server which allow an individual user to control who can access the information that he or she has created. See also *security, access controls, password*.

Private

A 3Com term for the 3+ access right for shared folders you want to keep to yourself. Only one person can use a Private shared folder at a time. You can share a Private shared folder with another user only by assigning a password to it an giving the password to the other user.

protocol

A formal set of rules for sending and receiving information in a communications system such as the AppleTalk network system, Ethernet, or Token Ring.

Publish

TOPS term for when a station makes a group of files available to others on the network. The station then becomes a server. See also background server.

R

Read/Write

A 3Com access right that allows all users to read from and write to (modify) a shared folder. Multiuser applications usually require this access right.

Read/Write/Create

A 3Com access right that gives free access to a shared folder.

registered user

An AppleShare user who has been given a name and password by the administrator.

Remote

A TOPS term, an adjective that refers to the resources located on the network. For example, TOPS allows you to mount a "remote volume". See also *local*.

S

scrambled

AppleShare term for coded, to avoid detection. A method of sending passwords from a workstation to a server in an encrypted form to avoid unauthorized detection on the network. See also *password, log on*.

security

Network security refers to the features which prevent unauthorized access to information of file servers or other network devices and resources. Security features usually include user authentication measures such as passwords and access controls for files. See also *password, access controls*

See Files

The AppleShare access privilege that gives the right to open and copy documents and applications in a folder.

See Folders

The AppleShare access privilege that gives the right to see folders within a folder.

Server

See *file server.*

Server (TOPS)

A TOPS term for any TOPS station that has published one or more volumes on the network. See also *file server, background server.*

server report

A document created by AppleShare Admin that gives you information about the server.

Service

A software program and/or hardware that provides a capability or function to network users. Examples are file service are print service. Some networks, such as 3Com have other system level services such as name service which are not directly encountered by typical users.

Shareable

A 3Com term for an access right that allows all users to create shared folders within the original shared folder.

shared folder

A 3Com term for a folder a user has made available to other users on the 3+ network.

shutdown

The temporary closing of the file server so it is not available on the network, such as for backup or maintenance.

Station

TOPS term for each computer on the network. Each station is given a name by its user when he or she signs onto the network. A station name can have up to 31 characters on the Macintosh or 15 on a PC.

T

TOPS for DOS

A TOPS software product for use with the FlashCard product (PC LocalTalk card) which converts an IBM PC or compatible computer using DOS 3.1 or later into a TOPS station.

TOPS for Macintosh

A TOPS software product which allows a Macintosh to become a TOPS station using built in LocalTalk hardware. See also *Station*.

TOPS Translators

TOPS utilities which translate a Macintosh file format to a PC file format and vice versa.

total users

The total number of user accounts or registered users that a file server allows.

translator

A program that changes the contents of a document created with an application in one operating system into a document that can be used with a similar application in another operating system.

U

unlink

A 3Com term for undoing the logical connection between a workstation (netstation) and a network object (file server, printer, etc.).

Unmount

TOPS term for a station "disconnecting" a mounted volume. See also mount, volume (TOPS), publish.

Unpublish

A TOPS term for removing a published volume from the network. See also *publish*.

V

volume

A hard disk or other hard disk whose drive is attached to a file server.

Volume (TOPS)

A TOPS term for a specified group of files - a folder or an entire disk - that can be published by a station on the network. A TOPS station can mount up to 6 "remote" volumes.

volume report

A document created by AppleShare Admin that tells you about the folders in a specified volume, such a the names, owners, groups, and access privileges for files and folders.

W

workstation

A Macintosh, Apple II, PC or other user computer that you can use to do your work and send or receive information over a network. AppleShare workstations are connected to the AppleTalk network system.

Write Only

A term for the access right that allows all users to change or add to a shared folder, but none can read it.

Z

zone

One or more logical networks, collectively identified by a zone name, that are part of a larger network interconnected by bridges. Users in a zone can easily share network devices such as printers and servers throughout the network. See also *bridge, internet.*